Information Management Self-Assessment FY99

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September 1999

Executive Summary

In a year that posed a variety of difficulties and challenges, the Computing, Information, and Communications (CIC) Division again showed its mettle by coming through with a year marked by success and service.

Much of 1999 was dominated by crisis management activities. Information security at the Laboratory was the subject of national attention, and much of CIC's resources and energy was necessarily devoted to this critical topic. Too, as we approach the final days before the turn of the millennium, Year 2000 efforts moved to the forefront and consumed additional management and staff time.

Nonetheless, as we clearly demonstrate in this self-assessment report, as a division, we have maintained and improved our high level of service to the mission of the Laboratory and have reached many notable milestones.

CIC Information Management (IM) is evaluated in four areas:
1. Operational Effectiveness
2. Customer Focus
3. Effective Internal Controls and Compliance
4. Strategic and Tactical Planning

In the area of operational effectiveness, FY99 brought the following major achievements:
- CIC financial stewardship has again "hit the target," as we expect to finish the year with a very close match between revenue and expenses.
- Security in our unclassified network has been strengthened with the implementation of a strong firewall behind which most of the network sits. This firewall is being hailed across the DOE complex as an exemplary effort, and it was accomplished even while network traffic was steadily increasing.
- Our Library Without Walls Project has increased its digital resources and outreach.
- Major advances have been made in enterprise computing systems:
  1. The Citrix server and Desktop on Demand services have simplified maintenance and provided convenient and rapid access to enterprise systems across the Laboratory.
  2. The Indus PassPort system has been placed in service, providing critical enhancements to the Laboratory's ability to do facility maintenance work.
- A critical classified document management system has been replaced with a more functional and Y2K-compliant system.
- Efforts to implement information and knowledge management across the Nuclear Weapons Directorate continued in two major areas:
  1. The LANL/Xerox CRADA has seen major accomplishments in the area of document capture.
  2. A product realization team effort has produced a comprehensive five-year plan for information and knowledge management across the directorate.

In the area of customer focus there are also many highlights:
- IM groups have conducted a number of customer surveys, learning that overall they are doing an excellent job of meeting customer expectations. In areas where improvement could be achieved, these groups are making plans to implement programs and measures to reach an even higher level of customer satisfaction.
- Customer satisfaction remains very high with the records inventory.
- Information Architecture (IA) standards, which are applied on a voluntary basis, continue to receive phenomenally high levels of acceptance within the Laboratory community.
- CIC Division's external review committee rated CIC as "outstanding" in every category of achievement, including customer relationships.

In the realm of effective internal controls and compliance, CIC has tackled and resolved some very difficult issues, including issues that have been with us for some time:

- Our records inventory work, which is the subject of a very specific agreement between the Laboratory and the Department of Energy (DOE), again will reach the status of “far exceeding” expectations.
- Printing and publishing, subject to specific regulatory requirements, are at last under control. Measures have been put into place to identify and control sources of printing that fall outside of the regulations and to keep us in full compliance with all applicable laws and regulations.
- Our Year 2000 remediation efforts are effective and on-track. All mission-critical systems have been remediated, and we are on a path to completing all other important systems by the end of September. The Laboratory will be ready when the millennium turnover takes place.

In the area of strategic and tactical planning, CIC unfortunately did not reach the extraordinary levels of achievement of the past few years. Executive management attention was necessarily focused on information security issues. Nevertheless, we did achieve some notable successes, and perhaps more importantly, have put in place a plan to quickly return to, and even exceed, the achievements of previous years. Planning activities in FY99 included the following:

- A full-day, upper-management CIC strategic planning session took place in January, producing a draft mission statement and a list of top division concerns and priorities.
- All CIC managers participated in a two-day retreat in Taos in July. Critical examination of issues within CIC resulted in numerous important action items:
    1. Careful examination of the directions of information services, focusing on the goal of “information stewardship.”
    2. Enhancement of the synergy between the division’s three organizational areas—information services, strategic computing, and research.
    3. Renewed emphasis on planning, with the goal of updating and revitalizing the division’s Integrated Management Process (IMP).
    4. Examination of the decision-making process within CIC.
- The IM Focus Team was reorganized to include all information services group leaders and has been chartered to examine internal IM issues.
- A Chief Information Officers (CIO) Council has been formed. This is a major breakthrough in developing a Laboratory-wide cooperative and unified approach to meeting the Laboratory’s IM needs.

In summary, CIC has done well in achieving our mission of responsible IM service to the Laboratory. The following pages document our achievements and lend support to our self-assessment of the Appendix F measures:

- Operational Effectiveness—Outstanding
- Customer Focus—Outstanding
- Effective Internal Controls and Compliance—Outstanding
- Strategic and Tactical Planning—Excellent

Performance Objective #1—Information Management (IM) Program

The Laboratory manages information resources on a corporate basis to improve the quality of its products, to add value to scientific programs and customer services, and to improve the Laboratory's work processes. (Weight = 100%)

Criterion 1.1—Operational Effectiveness

The IM program provides cost-effective products and improved services. (Weight = 30%)

Performance Measure 1.1—Operational Effectiveness

Evaluation of measurable improvements in cost-effective operations. (Weight = 30%)

Assumptions

Measurement deliverable—description of the information management program's accomplishments which have resulted in measurable improvements in the provision of cost-effective products and services. The description may be accomplished through reference to accessible work products or other existing Laboratory documentation.

"Operations" means the delivery of products and services.

Gradients

Good—examples that demonstrate measurable improvement and cost-effective, IM services and products.

Excellent—demonstrated results that contribute to institutional cost-efficiencies, savings, and improved operations.

Outstanding—external recognition of operational effectiveness or benchmarking that indicates best-in-class performance.

Performance Measure Results—FY99 Highlights in Computing, Information, and Communications

The majority of Information Management (IM) activities at Los Alamos are consolidated in the Computing, Information, and Communications (CIC) Division. The goal of CIC Division is to provide cost-effective products and services that enable our customers to accomplish their work effectively. Virtually every Laboratory organization depends on the availability of these resources in order to run its business efficiently. The IM umbrella at the Laboratory is very large and covers many disciplines. In this section, we highlight the achievements of CIC groups and projects that demonstrated the Laboratory's commitment to improving the quality of IM products, to adding value to scientific programs and customer services, and to improving work processes. Our achievements are discussed in the following order:

- Financial Management
- Unclassified Computer Network Security
- Library Without Walls
- Enterprise Information Applications (EIA)
- Desktop Support for the Laboratory
- Customer Service
- Network Traffic
- Information Storage and Retrieval
- LOCATES/CLOC

- Product Realization Team for Knowledge Management
- LANL/Xerox Knowledge Management CRADA
- Information Architecture Project
- CIC Distinguished Performance Awards
- Publishing Achievements
- Video Awards
- CIC Community Outreach

Financial Management

Sound financial stewardship has been a source of pride in CIC Division. This year is no exception, as we have managed our financial resources carefully to come very close to a revenue/cost matchup. In a year filled with unfunded mandates, such as information security and Year 2000 readiness, achieving these results is testimony to the importance we attach to financial management.

CIC Division finances are complex because they involve all six types of Laboratory funding:
- G&A (General and Administrative) Budget/Allocation
- Direct Recharge
- Institutional Recharge
- Organizational Support
- Direct Programmatic and Reimbursables
- LDRD (Laboratory Directed Research and Development)

The division's FY99 budget figures are charted in Figures 1.1-1 through 1.1-6.

The G&A (General and Administrative) Budget/Allocation for FY99 covered a variety of division functions that are funded as part of Laboratory's overhead—for example, the Research Library, records management, and administrative computing initiatives. For FY99, our G&A costs of $24.6 M were about $27K under the division's allocation, for a favorable variance of 0.1% (see Figure 1.1-1).

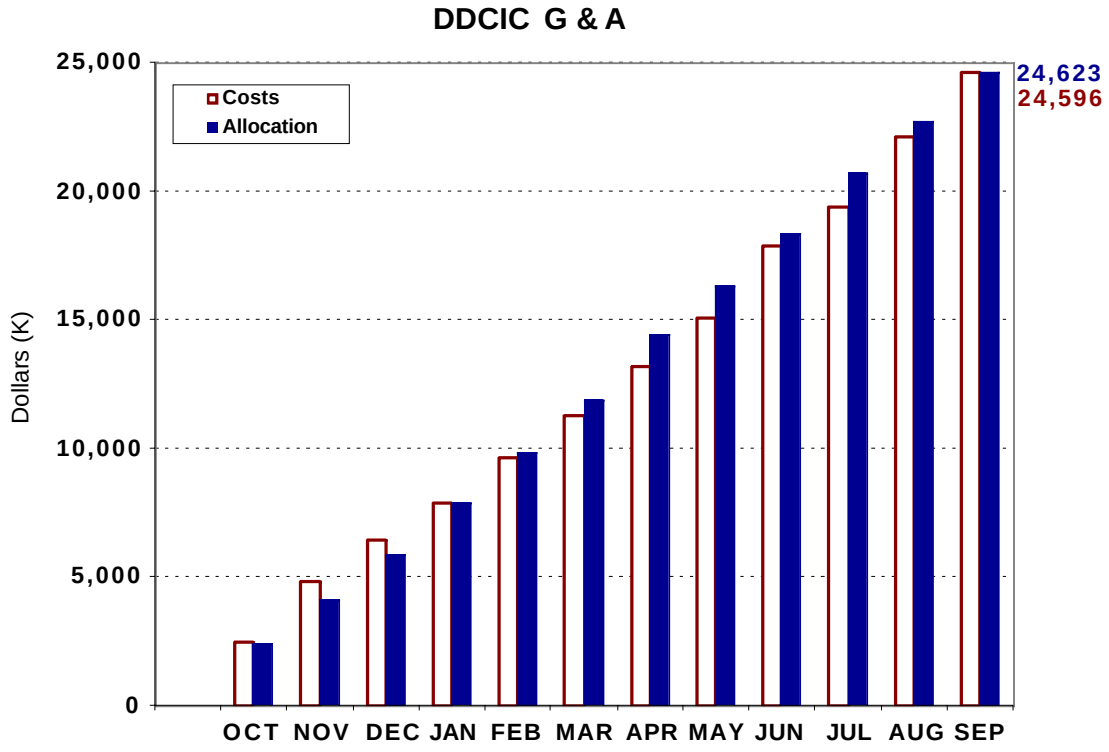


Figure 1.1-1. CIC FY99 budget for G&A.

Direct Recharge is funding that covers the cost of providing internal services to specific Laboratory customers, including CIC groups. Covered by this category are the computing services we provide to the Weapons Program as well as to our own groups, such as Communication Arts and Services and Desktop Support. For FY99, Direct Recharge costs were 31.6M and revenue was $32M, for a favorable variance of 1.2% (see Fig. 1.1-2).

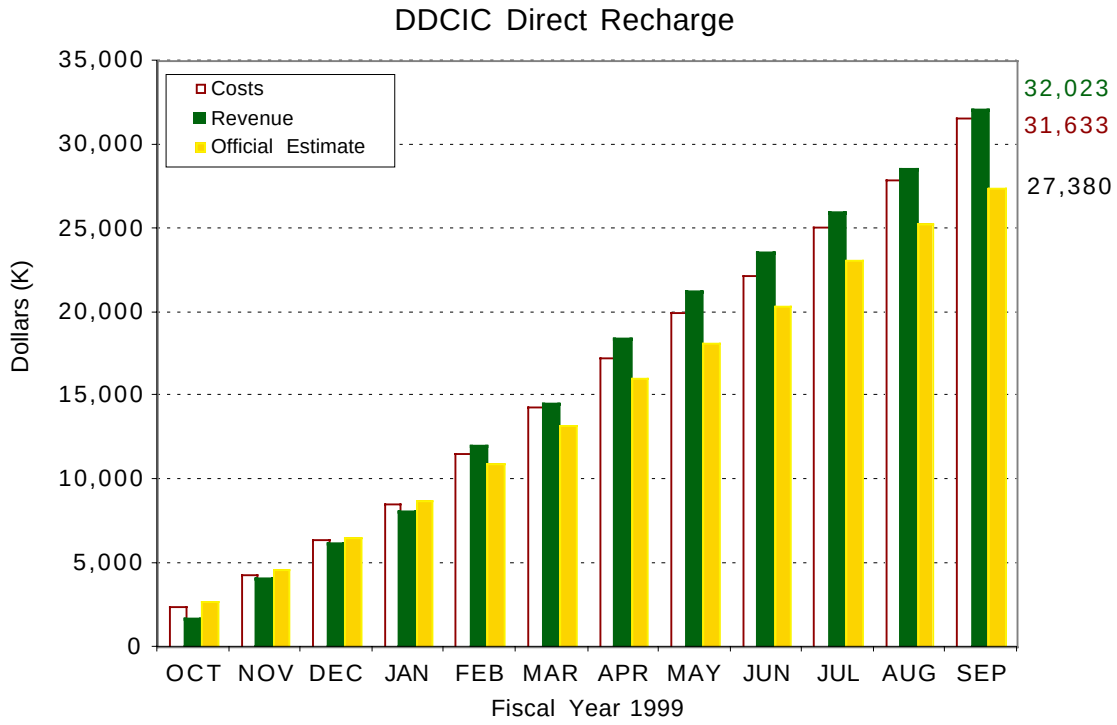


Figure 1.1-2. CIC FY99 budget for Direct Recharge

Institutional Recharge represents a pass-through of costs for CIC services that benefit the Laboratory as a whole. In CIC Division, this funding covers the telecommunication system, the computer network, and a portion of the costs for facilities management. For FY99, Institutional Recharge costs were $44K under the division's revenue of $45.9M, for a favorable variance of less than 0.1% (see Fig. 1.1-3).

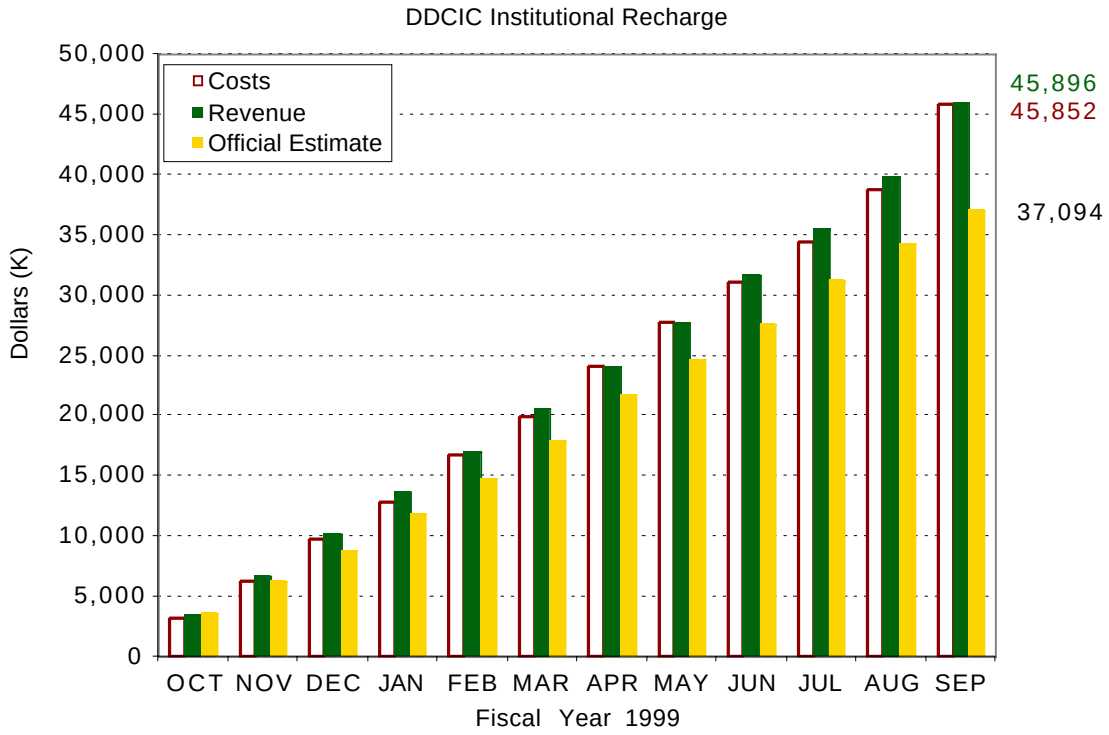


Figure 1.1-3. CIC FY99 budget for Institutional Recharge.

Organizational Support represents funding that both the division and group offices collect in the form of a tax on their base costs. The funding is used to support division and group administration. The tax percentage varies by organization, depending on its size and tax base. For FY99, our Organizational costs were $24.2M and our revenue was $25.7M, for a favorable variance of 5.8% (see Figure 1.1-4).

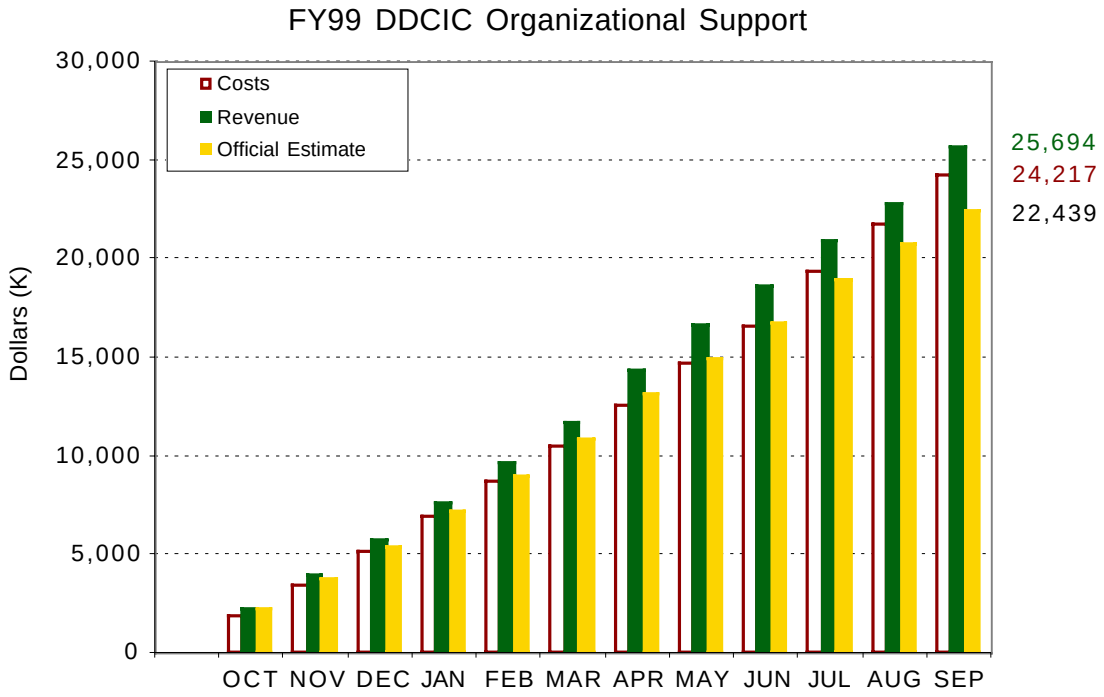


Figure 1.1-4. CIC FY99 budget for Organizational Support**.**

Through allocations and suballocations from Laboratory program offices and other divisions, CIC Division receives Direct Programmatic and Reimbursable funding. For FY99, our division was allocated $96.8M, of which about $4.25M will be carried over to FY 2000. The net FY99 allocation will therefore cover our costs of $91.7M with a positive variance of 0.9% (see Fig. 1.1-5).

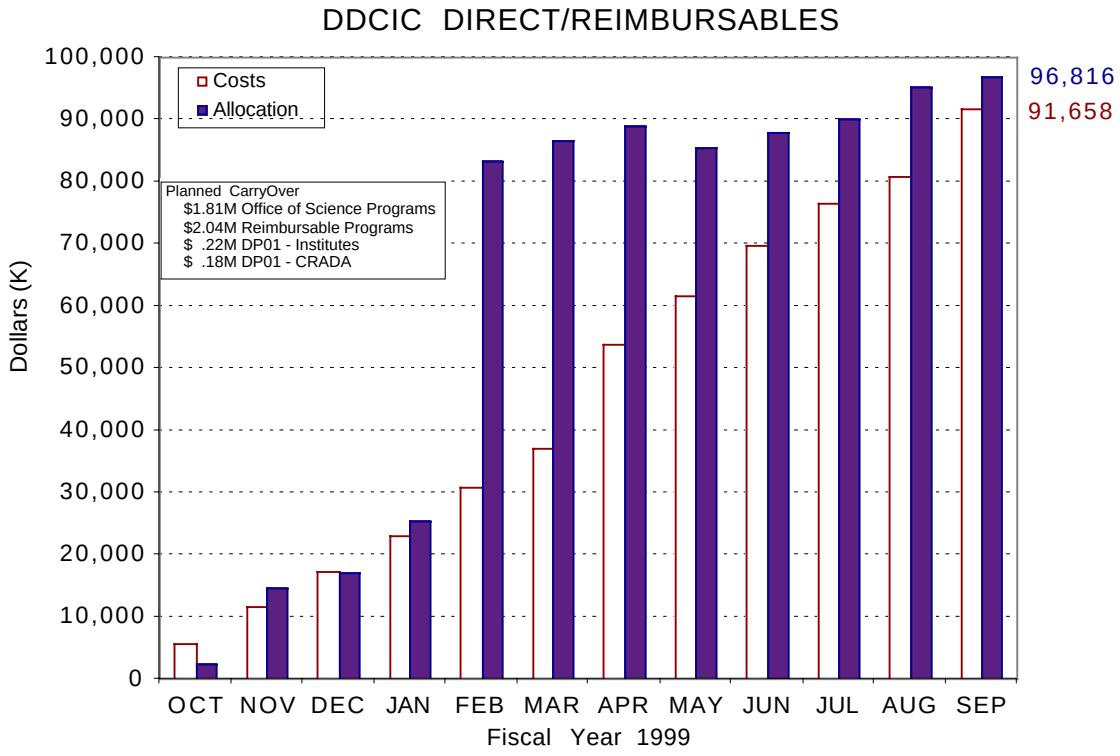


Figure 1.1-5. CIC FY99 budget for Direct Programmatic/Reimbursables.

LDRD (Laboratory Directed Research and Development) funding is an institutional allocation to be used specifically for research and development projects selected through a competitive process. The division received a total of $1.6M in LDRD funding for proposals that we submitted to the LDRD office. We also received $827K in suballocations to assist in work on proposals from other divisions. Costs for the division's own LDRD proposals were $1.5M, which gave us a favorable variance of 5.2% (see Fig. 1.1-6).

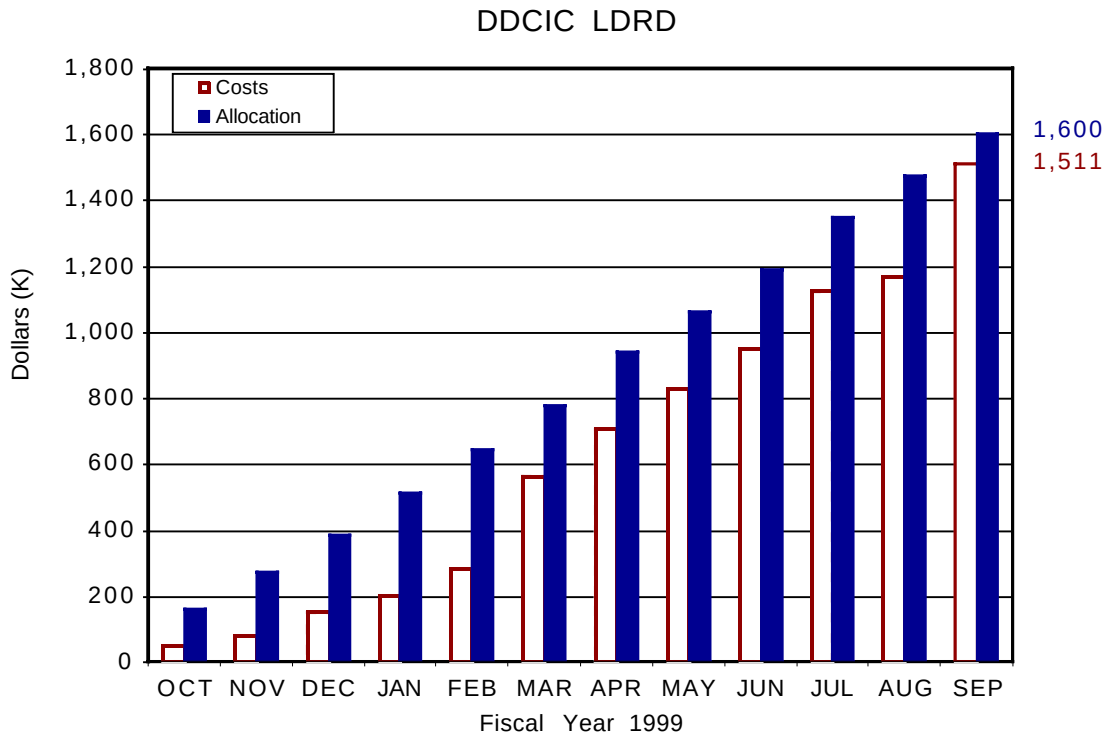


Figure 1.1-6. CYC FY99 budget for LDRD work.

Unclassified Computer Network Security

The Network Engineering Group, CIC-5, undertook two major initiatives this past year to dramatically improve unclassified network security by protecting network computers from hackers and other unauthorized intruders. The first was to eliminate the use of clear-text reusable passwords to access CIC-supported computers and servers. Such passwords are easily "sniffed" by hackers, who then use them to assume the identity of a Laboratory employee. The decision was made last August to accept only one-time passwords generated by token cards such as a "SecureID" or a "CryptoCard." Since the passwords or passcodes generated by token cards can be used only once, sniffing is not useful to hackers. By September 15, 1998, all CIC institutional machines were converted to accept only token-card-generated passcodes.

Approximately 4,500 token cards were distributed within a 6-week period through a crash effort that included user training via Web pages and printed instructions. This brought the total number of token cards in use at the Laboratory to approximately 8,500. Ten CIC-5 staff members worked more than full time to order, process, distribute, and activate the token cards.

The second major initiative began last October, when John Browne directed us to design and implement a restrictive network firewall to increase the security of the Laboratory's unclassified computers. The firewall shields Laboratory machines from hacker attacks and limits the types of computer connections that are permitted from the Internet.

The new firewall divides the unclassified network into two regions—called the “green” and “blue” networks. The green network is similar to the previous open partition. It has few network-level restrictions and is intended for a small number of machines that need to be easily accessed by anyone from outside the Laboratory. A good example is the server for Laboratory’s external Web home page. The blue network is separated from the Internet and the green network by the restrictive firewall, which consists of a series of filtering routers and proxy servers. Access to blue computer systems from the Internet requires strong authentication with a token-card-generated passcode.

By default, unclassified computers at the Laboratory went into the blue network. To move computers into the green network, system administrators had to obtain written approval from their division director and the Computer Security Group (S-5). Because of the limited protections on the green network, part of the approval process included documentation of how the computers would be protected from hackers on the Internet.

The firewall drastically changed the very nature of Internet access to Laboratory computers. With it, the number of Lab computers directly accessible from the Internet dropped from over 18,000 to fewer than 180. Information to be publicly accessible had to be identified and moved to green network servers. Existing servers had to be split into blue and green components. For example, the Laboratory’s home page had to be split across green (“external view”) and blue (“internal view”) servers. Certain network protocols would no longer work or would not work the same way through the firewall. This forced system administrators to change how their systems operated. In one way or another, the firewall implementation affected everyone at the Laboratory.

Despite the firewall’s wide-reaching impact, however, its final implementation on March 15 turned out to be a “nonevent” because of our publicity campaign on what employees needed to do to prepare for it. Between late October and the March cutover, some 15 CIC Division staff worked days, nights, and weekends on the firewall’s technical implementation as well as on a massive effort to explain the firewall to Laboratory employees. At one point in mid January, the team was doing as many as four presentations per day to a variety of audiences. In all, more than 100 presentations were given to Lab divisions and groups. We also maintained a Q&A e-mail address and a Web site devoted to firewall how-to’s and FAQs. The firewall team did a heroic job of educating users, listening to their concerns, and balancing computer security with operational efficiency.

The quality and significance of the firewall team’s efforts were acknowledged in August, when the team was given a Distinguished Performance Award by the Laboratory. The firewall itself received praise from George Armstrong, chief auditor from the DOE Office of Security Evaluations, who observed: “Our firewall expert, and he is an expert, was not able to penetrate into the blue partition. It appears to be a well designed firewall. The use of commodity routers and proxy servers in the manner in which LANL is doing is very innovative—LANL appears to be ahead of the other Labs in this area.”

Library Without Walls

The mission of CIC-14’s Library Without Walls Project is Web delivery of information to researchers’ desktops from digital library resources. The project’s long-term goal is creation of a network of knowledge systems that facilitate collaboration among researchers.

This year the Library Without Walls Project moved closer toward these goals by

- developing and deploying Social SciSearch® at LANL, an index to 3,300 social science journals based on our SciSearch® at LANL database,
- increasing the number of electronic journals available to the desktop from 1,000 to 2,200,
- developing a new interface, called E-Print Archive, to LANL’s xxx preprint database, and
- making the 4.4-million-record Engineering Index available via the Web.

Through the project, 2,200 full-text, full-image journal titles are now available electronically for authorized LANL users. We are collaborating with several publishers to provide electronic journals to the desktop as portable document format (PDF) files. These publishers include Academic Press, Elsevier Science, Institute of Physics, Springer-Verlag, American Mathematical Society, American Physical Society, and Kluwer. In addition, members

of the New Mexico Library Services Alliance have joined us in this collaboration and are cooperating on consortium purchasing of electronic journals.

Figures 1.1-7 through 1.1-9 demonstrate the continuing rise in customer use of our digital library resources.

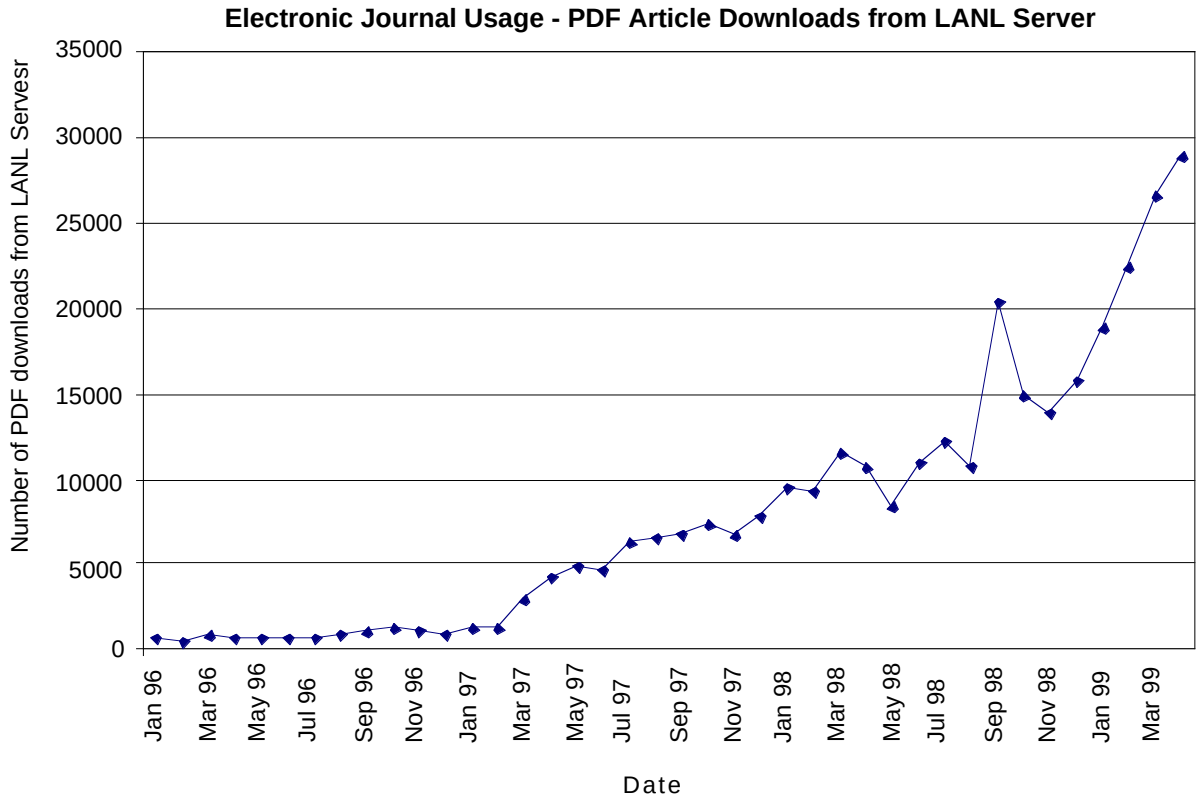


Figure 1.1-7. The number of articles downloaded as PDF files from our electronic journals increased dramatically over the past year.

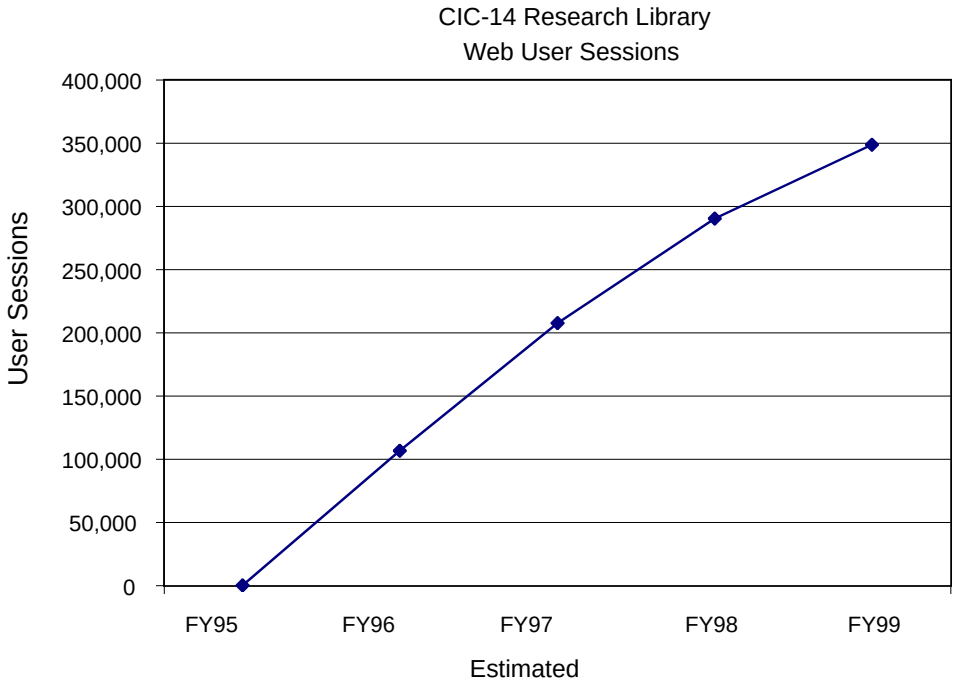


Figure 1.1-8. The number of Research Library Web user sessions has steadily increased.

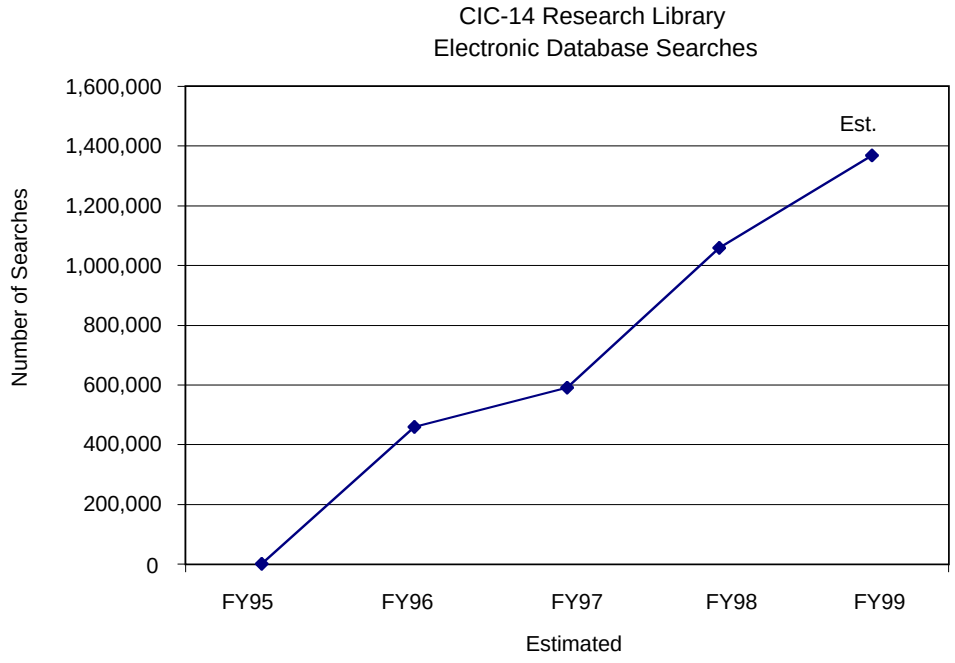


Figure 1.1-9. Growth has remained steady in CIC-14 database searches over the last five years.

The Library Without Walls Project has been designated by the DOE and the Laboratory as a User Facility. This designation permits us to partner with external customers in delivering digital library services outside the Laboratory and provides a medium for future technology exchange. We are now providing access to digital resources to ten DOE laboratories and research centers, to ten Air Force research facilities and bases, as well as to Stanford University, University of New Mexico, New Mexico State University, and New Mexico Tech. Figure 1.1-10 shows the growth in our external customer base that has resulted from increased collaborative work.

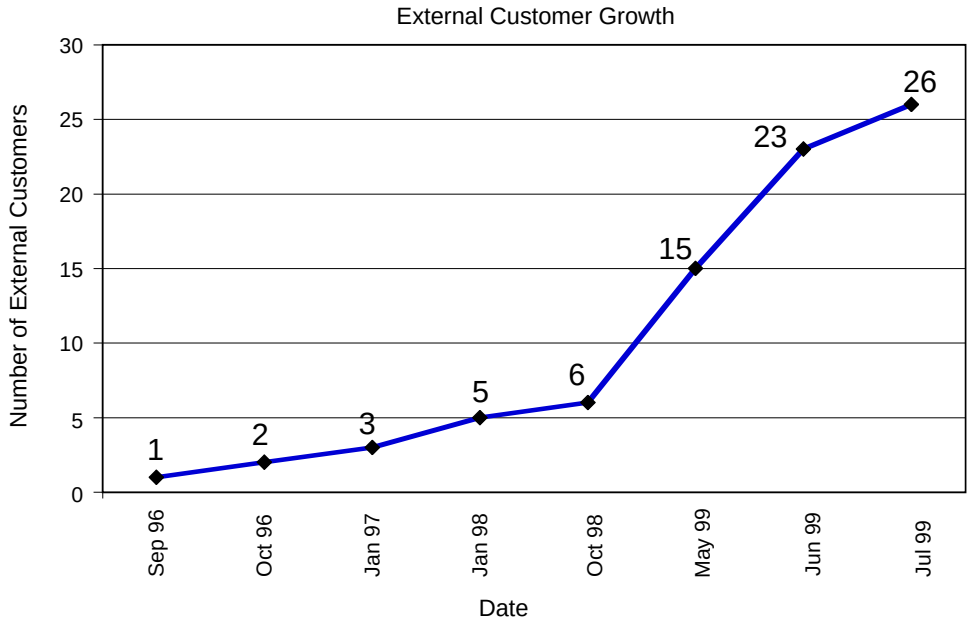


Figure 1.1-10. The Research Library's external customer base has grown substantially over the past year. This growth is a direct result of collaboration with outside organizations.

Operational Effectiveness Metrics

As shown in Figures 1.1-11 and 1.1-12, we continued this year to increase Library staff productivity and to hold our costs down. Two factors are behind the significant improvements in both metrics that have occurred since 1994: at that time, we began to offer new products and services as a result of the Library Without Walls Project and to implement our strategic business management system, which is discussed under Criterion 1.4.

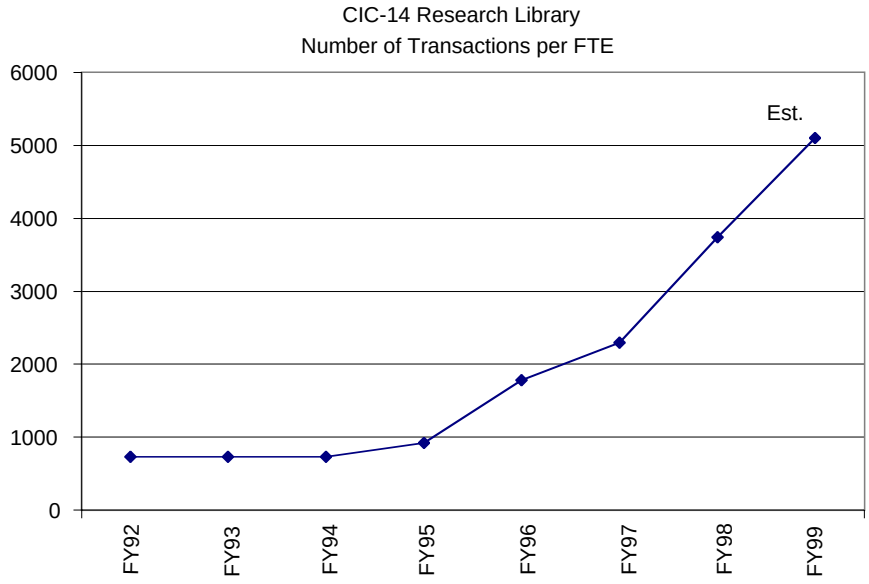


Figure 1.1-11. The number of transactions per full-time employee (FTE) at the Research Library has increased significantly over the last five years.

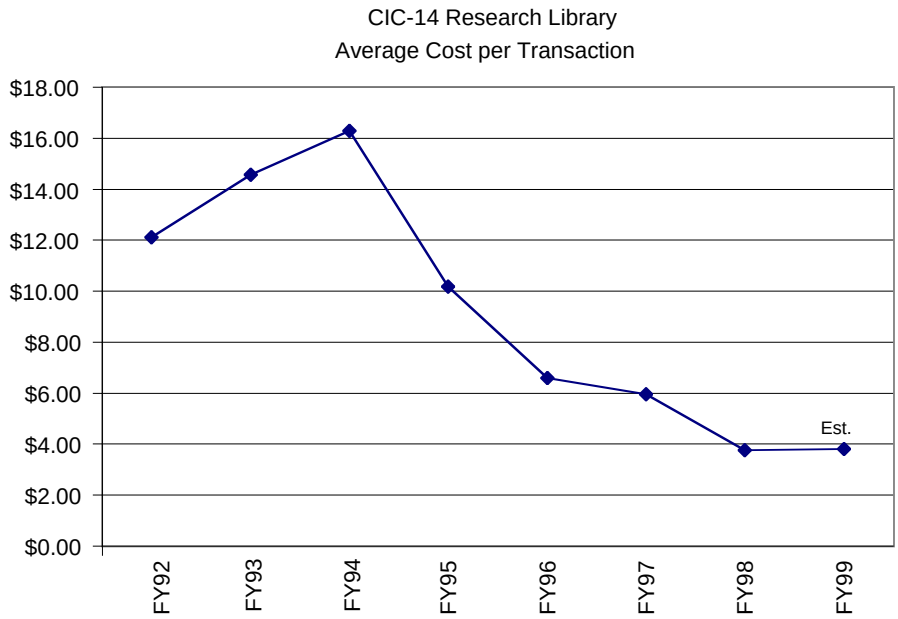


Figure 1.1-12. The average cost per Library transaction has declined by more than 75% since FY94.

Library Awards and Recognition

In the summer of 1998, the Research Library received two first-place national awards from the Special Library Association for marketing materials (a video and Web page) and a second-place award for specialty marketing materials (brochures, posters, etc.).

The March 1999 issue of *ONLINE* magazine featured the Research Library as a "cutting-edge, customer-driven library" that operates on a "vision of information services that is a harbinger of change not only for library technology, but also for the relationship between libraries and their information providers." The library was also featured in a cover story—"Library Without Walls Uses Technology to Open Information Doors"—in the Sunday edition of the *Los Alamos Monitor* on August 1, 1999.

Another indicator of our success as a research library is the number of benchmarking visits we have received. This past year, we hosted visits from 11 organizations:

- NIST (National institute of Standards and Technology)
- Elsevier Science
- Air Force Research Laboratory
- DOE/Office of Scientific and Technical Information
- Naval Research Laboratory
- Lawrence Livermore National Laboratory
- Access Innovations
- John Wiley & Sons
- Stellenbosh University (South Africa)
- Lovelace Respiratory Research Center
- CSIRO (Commonwealth Scientific and Industrial Research Organization) for Australia

About 75% of the visits were prompted by our success in the Library Without Walls Project, with the remainder stemming from interest in our methods for customer management and strategic business planning.

Finally, the number of invited papers and talks our staff members give each year describing their work continues to increase (see Figure 1.1-13).

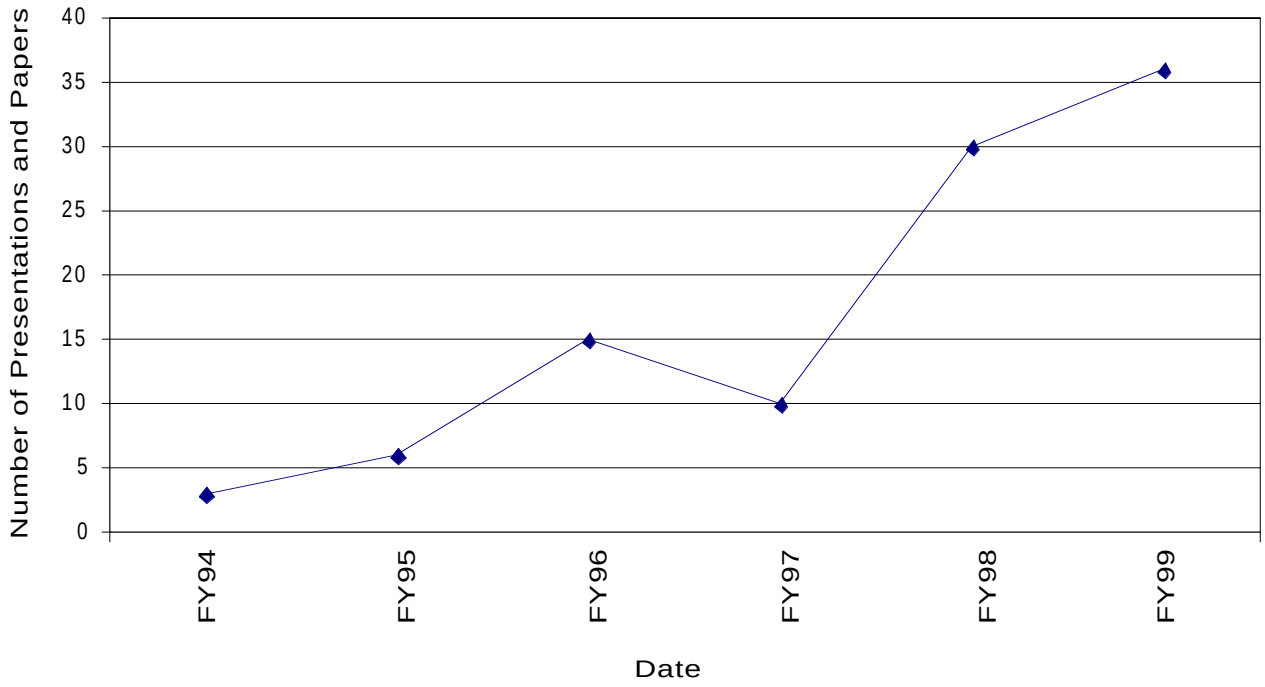


Figure 1.1-13. The number of papers and presentation given by Library staff has increased over the past few years.

Enterprise Information Applications (EIA)

Citrix

CIC-13 implemented Citrix to improve Lab-wide access to EIA business applications such as Data Warehouse, Time and Effort, Travel, and Purchase Card. Instead of being installed, upgraded, and maintained on individual machines all over the Laboratory, these client-server applications are now maintained on centralized servers. All that users have to install is the Citrix thin client, which allows their computers to talk to the servers. The introduction of Citrix has made these client-server applications available to Unix users for the first time, eliminated the necessity for downloading and installing new versions of the applications, reduced the maintenance required on the part of users, and increased the efficiency and while decreasing time-to-user of developing and maintaining client-server applications. Most important, data security has been improved because communications between users' computers and the server are encrypted. Growth in Citrix usage is shown in Figure 1.1-14.

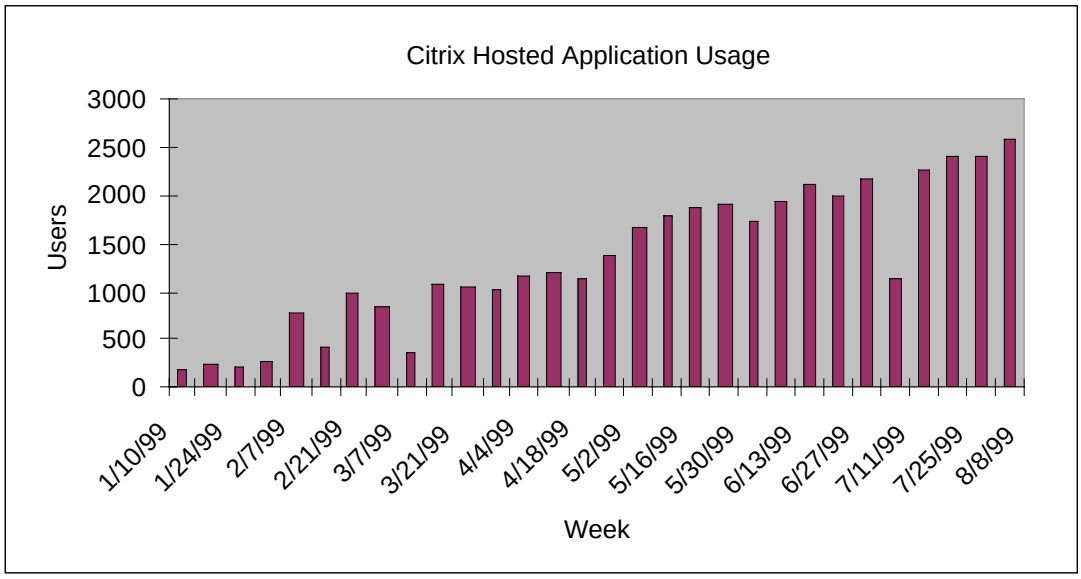


Figure 1.1-14. Use of Citrix-hosted applications continues to rise, reflecting the move away from deployed software toward centralized hosting.

Desktop on Demand

Desktop on Demand is a CIC-13 product that makes it possible for a user to set up a personal desktop that can be accessed from virtually any computer, anywhere. The desktop can include a variety of commercial software products (e.g., Microsoft Office) as well as the Laboratory's EIA software, all of which are stored on the enterprise server and accessed by the user remotely. Because the software is stored centrally, users no longer need concern themselves with installing and maintaining software or downloading new versions. With Desktop on Demand, Macintosh and Unix users are also able to take advantage of software previously available only to Windows users. Data backups are also managed centrally, and all information transmitted between a user's computer and the server are encrypted. Usage statistics for this new product are shown in Figure 1.1-15.

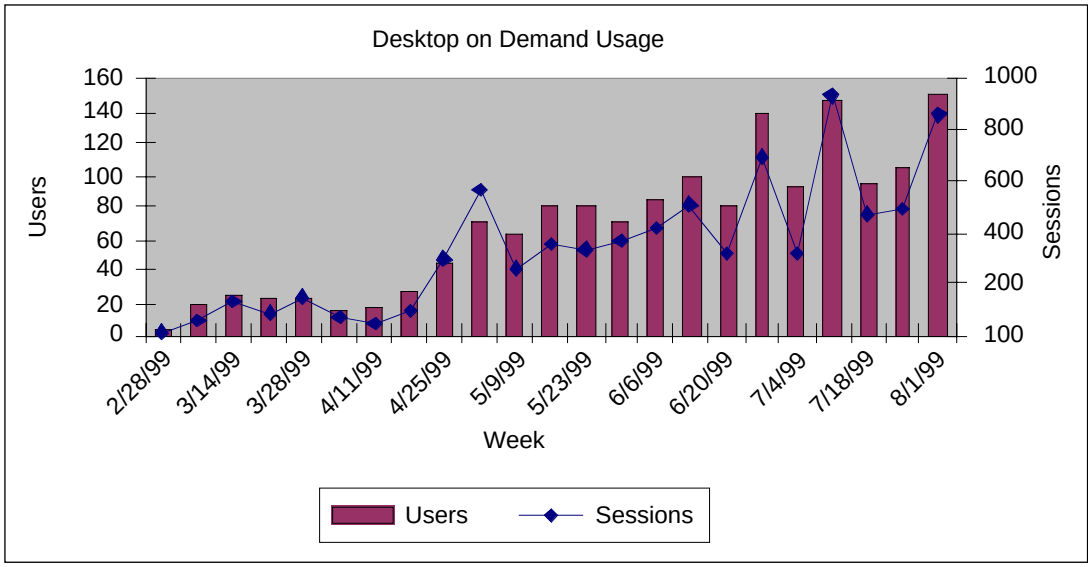


Figure 1.1-15. Use of Desktop on Demand continues to climb as more people take advantage of its unique features.

EIA Web Site

CIC-13 created the EIA Web site to provide users throughout the Laboratory with a single portal to all Laboratory business applications. From the EIA site, users can connect directly to Web-based applications and to client-server applications on the enterprise server. IBM-based applications are also listed, along with instructions for accessing them. The site also includes links to application-related documentation, to sources of software support, and to other sites that might be of use to EIA users, such as a link to the ICN Registry. Use of this easy access to the Lab's business applications continues to climb, as shown in Figure 1.1-16.

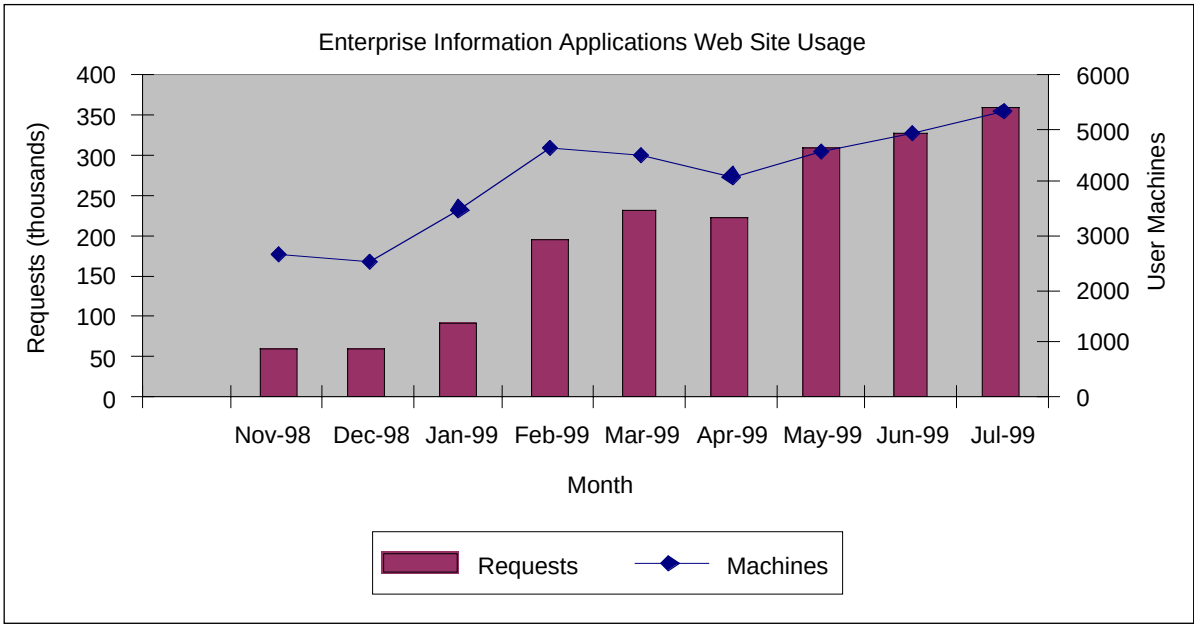


Figure 1.1-16. Use of the EIA portal Web site continues to increase as more business applications and other useful content are added to it.

EIA Platforms

We progressed on our long-term strategy of moving to a more homogeneous EIA infrastructure. At the beginning of this year, six different platforms were used. Our goal is to get down to three:

- The Wang platform has been completely converted to IBM's SP platform.
- VAX usage has been reduced by 50% by converting applications to IBM.
- Solaris usage has been reduced by 30% by conversions to the IBM/SP platform**.**

The cost avoidance that results from these conversions has been invested into scaling up the remaining platforms for enterprise applications. Long-term this will result in a decrease in overall platform costs because of efficiency gains from bundling purchases, discounts on contract negotiations, and overlapping skill sets of administrators and programmers. Creating a more homogeneous infrastructure will also reduce transaction costs and shorten product delivery times.

Computerized Maintenance Management System (CMMS)

CMMS is a suite of integrated software applications designed to assist in planning, managing, and administering the Lab's facility maintenance work. A CMMS can track maintenance work and costs by each piece of equipment and work order; control work by prioritizing, planning, and scheduling it; and manage the materials, parts, and labor required for maintenance work.

A CMMS will enable the Laboratory to improve facility maintenance, upgrades, modifications, and construction processes in accordance with proven industry standards and best-business practices. When fully implemented, the CMMS will establish a consistent Lab-wide system that allows for maintenance planning, auditing, and interfaces with other Lab-wide systems; that coordinates discrete work requirements and priorities and tracks

work progress; and that communicates cost and schedule impacts that might affect strategic management objectives or require adjustments to other work priorities, plans, and schedules.

To reengineer the Laboratory's maintenance management processes and implement the Lab-wide CMMS, a multidisciplinary and multiorganizational team was created. The CMMS core team was tasked to evaluate and reengineer Laboratory processes such as the master equipment list (MEL) hierarchy, preventive maintenance, corrective maintenance, upgrades and modifications, and construction. The team was also tasked to define what the CMMS should do, identify resources necessary for CMMS implementation, and measure CMMS performance.

This year, the CMMS team procured a software system, PassPort, for implementing the CMMS. As processes are reengineered, they will be integrated into this system. The PassPort modules to be implemented initially at the Laboratory are (1) work management, (2) inventory and warehouse management, and (3) labor entry and reporting. Last August, pilot work with PassPort was begun; between August and June, the MEL data were loaded; in June, the work management, inventory and warehouse management, and labor entry and reporting were implemented and made available to all users.

Successful implementation of the CMMS requires the support of not only users—facility management unit (FMU) teams—but also senior managers, facility owners, and support organizations. In coordination with the Institutional Facility Management Program Office, the CMMS team is working to establish Lab-wide communication and education links that explain CMMS goals and progress.

Desktop Support for the Laboratory

CIC-2 support for Lab-wide computer operations resulted in continued economies of scale in software licensing, progress toward automating desktop management, and competitive desktop support services.

Electronic Software Distribution (ESD)

ESD, which is operated by the Remote Electronic Desktop Integration (REDI) team, provides discount software licensing and enables Lab personnel to purchase, register, and install software via the Web. Working through local software resellers, the team negotiated new or renewed contracts with most major software companies. This year ESD offered over 800 software packages representing varying versions of more than 300 separate products at significant discounts compared with purchases through the Lab's just-in-time software contract. During the first ten months of FY99, software purchases through ESD reduced Lab expenditures by over $3.0M. More than 46,000 new licenses were purchased, bringing the total number of active licenses in the ESD License Registry to over 147,000. Table 1.1-1 compares total cost reductions in software licensing achieved through ESD over the last five years.

Via the ESD Web site, users can shop for, purchase, register, and download software. Purchases are made with valid Los Alamos charge code information. ESD uses stringent security measures to ensure that only authenticated users can purchase licenses and that only registered license holders can obtain software. After purchasing software, users can either download an installer package to their desktop for later installation of the software, or they can "net-install" the software directly from the ESD software server. The latter option is far more efficient and enables ESD to offer products whose file size would otherwise preclude electronic distribution. During the first ten months of FY99, ESD users downloaded or net-installed more than 121,000 software products.

Throughout FY99, the REDI team worked to expand the products offered through ESD. In addition to the software identified as Lab standards by the Information Architecture Project, numerous products in support of the Lab's enhanced cybersecurity work were made available. The Microsoft Select program was extended for another two years and included procurement of a Lab-wide access license for NT servers. Agreements for expanded product-line availability were also negotiated with other major companies, including Adobe, Symantec, Network Associates, Sun Microsystems, and Silicon Graphics.

Table 1.1-1: Software Licensing Savings (Cost Avoidance)

	Cost Avoidance (in thousands of dollars)				
Company and/or Product	**FY95**	**FY96**	**FY97**	**FY98**	**FY99**
Microsoft	-	-	1,300	1,520	1,304
Netscape*	97	228	400	290	-
Macintosh†	13	441	80	(55)	126
Sun OS	564	560	545	560	560
Sun Compilers	91	91	475	91	-
Silicon Graphics OS	-	-	42	20	60
OnNet-PC/TCP	375	300	344	100	-
Eudora E-mail	-	-	330	250	257
Lotus Notes	62	30	14	-	-
Meeting Maker	-	-	60	112	-
JetForm	5	181	290	182	-
McAfee (Virus Scan, NetSchield)	-	-	-	100	343
Symantec (NAV, SAM, Norton Utilities)	-	-	-	97	162
Adobe (Acrobat, Exchange)	-	-	-	47	401
Telnet	-	-	-	22	-
HyperSnap	-	-	-	22	-
Claris (FileMaker, HomePage)	-	-	-	18	36
RealNetwork	-	-	-	-	31
License recycling‡	-	-	-	-	91
Other§	-	-	57	33	85
TOTAL	1,207	1,831	3,937	3,409	3,456

*FY98 savings are those realized before the product became free.

†The loss posted for FY98 reflects the fact that we had just signed an agreement for maintenance through May 2000 and had not yet realized any savings.

‡Savings from automatically redistributing licenses of employees who have left the Lab.

§Includes WS_FTP, Fetch, Darkside, Cleansweep, DataViz, and FWB.

System Management Server (SMS)

SMS is a CIC-2 service that automates the management of PC and Macintosh desktop systems. The service inventories system software and hardware, providing information on what services a given desktop can use and what resources (e.g., disk space and memory) are available; automates software delivery and installation; and enables remote user assistance and desktop maintenance.

After successfully piloting SMS in FY98, the REDI team offered the service to four customer organizations this year, installing SMS on nearly 700 desktops. Much was learned about the resources, logistics, and infrastructure required for automated desktop management at the Laboratory. In particular, we learned that the SMS tools alone will not improve desktop service but must be used as part of a more comprehensive desktop support model that addresses business practices and procedures. We are currently developing such a model, known as Premium Desktop Service, for use within CIC Division in FY 2000. We also started a project aimed at establishing of a Master NT Accounts Domain (MAD) for authenticating all Lab computer users who access NT server resources.

In parallel with offering SMS, we visited Intel and IBM to learn how they do “seat management,” industry’s term for managing desktops centrally as a corporate asset. We learned that they use a central assistance center to redirect all service calls, use remote administration tools, and use automated tools for software version-control and distribution. Our new Premium Desktop Service will incorporate such features. We also did some internal benchmarking with other Lab desktop support groups that service divisions within the Nuclear Weapons Directorate (CIC, DX, ESA, TSA, NMT, and X). This study confirmed that we are all using the same basic tools to provide desktop and local-area-network (LAN) services and that to improve those services, we need to change the environment in which they are offered—which is the goal of our new Premium Desktop Service.

Desktop Support Metrics

Desktop computer support at the Laboratory is primarily negotiated through annual contracts and delivered by full-time technicians who work on-site with their customers. To determine the cost per desktop for this support, we divide the average cost of a contract by the total number of desktop systems being supported. This average cost ranges from about $700 per year for customers who have standardized hardware and software to $2,200 per year for customers with specialized equipment and servers. Table 1.1-2 compares our desktop support metrics over the last four years.

Table 1.1-2: Comparison of Desktop Support Metrics

Support Metric	FY96	FY97	FY98	FY99
Percent of contracts reported	10%	54%	77%	80%
Desktops per technician	55	73	89	81
Cost per desktop	$ 1,670	$ 1,250	$ 1,150	$ 1,247

Two factors are behind the slight increase in our average cost per desktop for FY99. First, we added technicians on several understaffed contracts, improving service for these customers. Second, the average salary for technicians increased from $86,545 to $89,687. Desktop support and LAN administration continue to be very competitive fields, and our salaries had to increase for us to attract and retain qualified support staff. By comparison, however, the industry-wide average for desktop support rose quite sharply. According to Gartner Group data, the average is now $1,428 per desktop, up from last year's figure of $1,020. The group cited general cost increases and the inclusion of more network administration duties in support work as factors behind the rise. This new figure more accurately represents the mix of work reflected in our desktop costs.

While remaining competitive in our support costs, we also took on desktop and LAN support responsibilities for two more Lab divisions this year—Materials Science and Technology (MST) and Applied Theoretical and Computational Physics (X) Divisions. These acquisitions increased the number of desktops and servers that our group manages by 25% (about 2,000 new desktops were added).

Customer Service

Computer Literacy Training

For the last two years, the Customer Service Group (CIC-6) has participated in the Lab's orientation training for new UC employees, a two-day class that introduces them to the Lab's organization, history, and procedures. On the first day, the CIC-6 training team presents an overview of the Lab's computing environment, covering such topics as computer security, structure and procedures for the Integrated Computer Network (ICN), enterprise applications and operations, availability of high-end computers, and desktop environments. Since July 1997, more than 1,500 employees have received our computing briefing.

This May, the training team developed and presented a weekly introduction to both business and scientific computing for new or returning students who work at the Lab during the summer. Within hours of announcing the classes, the team had to schedule six sessions to accommodate enrollment requests. By July, 95 students had attended eight sessions.

BITS: Computing and Communications News

Since November 1975, the computing division at Los Alamos has produced a monthly publication that provides Lab employees with the information they need to work within the Lab's varied computing environment. Over the years, this publication has changed names, content, direction, focus, and appearance, but it has always been intended to convey important and timely information to our user community. In 1995, the publication was given its present name, *BITS*.

In June, we produced our fourth special edition of *BITS*, "Introduction to Computing @Los Alamos," which provides a comprehensive overview of how to use workstations, networks, application servers, and supercomputers. Because of the constantly changing capabilities of our computing environment, almost 40% of this 60-page issue represented new information.

Also in June, we redesigned *BITS*, giving it a new color cover (see Figure 1.1-17) and wider-ranging content. Responding to input from a customer survey, we are targeting the publication to a wider audience, covering not only supercomputers but also desktop, enterprise, and infrastructure issues. *BITS* content will also be more contributory, containing articles written by providers, users, and sponsors of the various elements of the Lab's computing environment as well as offering a forum for user input on changes that should be or have been made to that environment.

The new *BITS* is fully Web-enabled. For each issue, subscribers receive an e-mail message that lists the table of contents; by clicking on an article's title, they can call up an electronic version to their desktop. In a few months, they will be able to choose whether or not they want to receive the hard-copy publication.

Figure 1.1-17. *BITS'* new color cover rolled out with the June/July issue.

Consultants' Conference

In April, CIC-6 hosted a Tri-Lab ASCI Consultants' Conference in Santa Fe. The two-day meeting brought together more than 70 help desk personnel from Livermore, Sandia, and Los Alamos as well as from the Idaho National Engineering and Environmental Laboratory, San Diego Computer Center, and National Energy Research Supercomputer Center (see Figure 1.1-18). Presentations covered help desk structure, audience, tools, funding, focus, and issues at all six organizations. In addition, Gerald Spalding, a nationally known speaker, gave two motivational talks on improving customer satisfaction with help desk service and reorienting the role of the help desk to add more value to the organization.

The conference provided a valuable forum for discussing common help desk problems and for networking on their solutions. On the second day, help desk managers met to specifically address scenarios of consulting growth under the ASCI (Accelerated Strategic Computing Initiative) program. Plans are underway for this meeting to become an annual affair.

Figure 1.1-18. Participants in last spring's Tri-Lab ASCI Consultants' Conference held in Santa Fe.

Improving Service with Remedy

Last November, we implemented a common entry screen to Remedy, our database for recording user problems (see Figure 1.1-19). The new entry screen enables the disciplined logging of problems by all Customer Service teams that use Remedy (ICN, desktop, enterprise, and training). It collects such information as the time of call, category of problem, type of machine environment, problem as stated by the user, and resolution as given by the consultant or, if not resolved, to whom the problem was referred. Previously, the ICN, desktop, and enterprise teams used screens customized to their individual services.

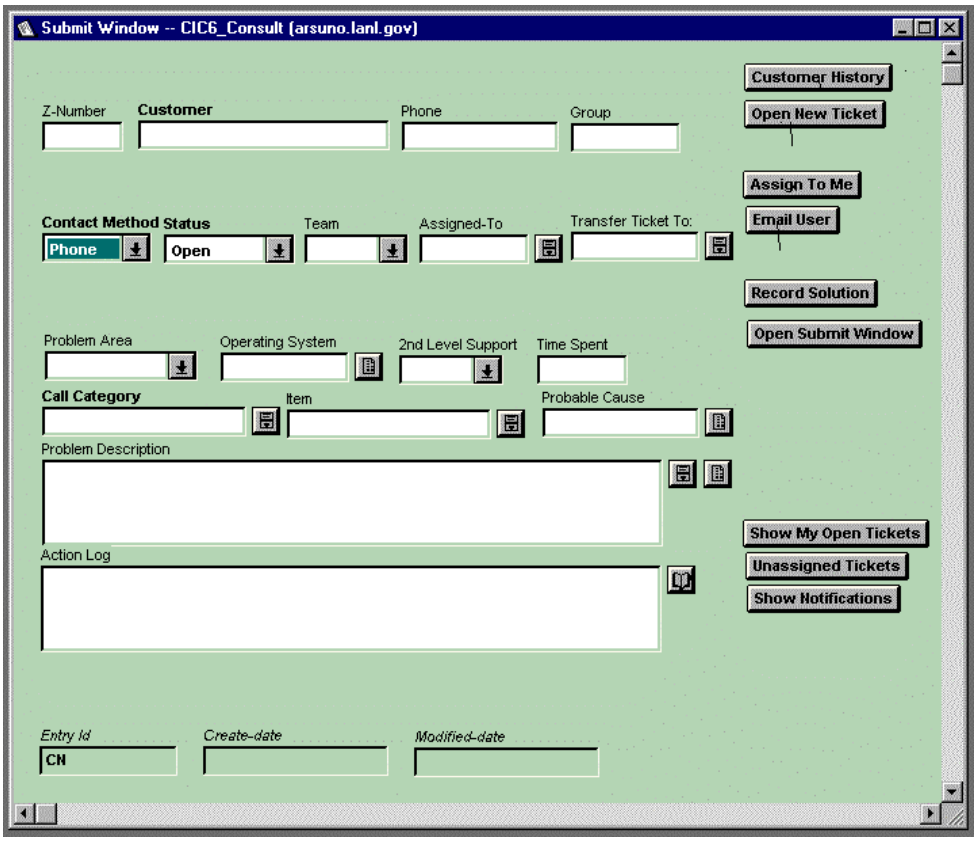


Figure 1.1-19. New entry screen for Remedy. Its common use by our ICN, desktop, enterprise, and training teams is allowing us to collect more-comprehensive statistics on the causes of user problems.

Data from the new screen is enabling us to define the “causes” of problems. For example, causes could be that a machine was not available, the software was incorrectly installed, user information or training was erroneous or inadequate, permission was not granted for some activity, or the desktop environment was incorrectly configured. Collecting this information has just begun to show its usefulness.

For example, the Adstar Distributed Storage Manager (ADSM™) is the division’s automated data backup system. It automatically backs up individual desktop machines as well as very large, centralized servers. Our Remedy data indicated that CIC-6 consultants were receiving a disproportionate number of phone calls regarding this system (Figure 1.1-20). By analyzing that data over several months, we found that the central causes of user frustration involved improper installation, lack of procedural knowledge, and useless error messages (see Figure 1.1-21).

We then examined the profile of ADSM installations over time from the data kept by our ADSM administrators. It revealed growing usage of ADSM, which had always been interpreted as successful deployment of the system. Following the data to another level, however, showed that the while overall system usage was increasing, so was the growth in ineffective or useless ADSM nodes (Figure 1.1-22). It became clear that the effectiveness of the ADSM system was high for large, administrator-managed servers (accounting for about 97% of the stored data) but low for individual desktop machines (accounting for about 3% of the stored data). In fact, more than 80% of ADSM problems were coming from small-system users.

Given this information, discussions are ongoing that address ADSM installation procedures, appropriate audience, and utilities that will aid self-administration on small machines. We expect that the ADSM system will continue to provide high-quality service to its major customers and that we’ll see a decrease in its use for desktop machines.

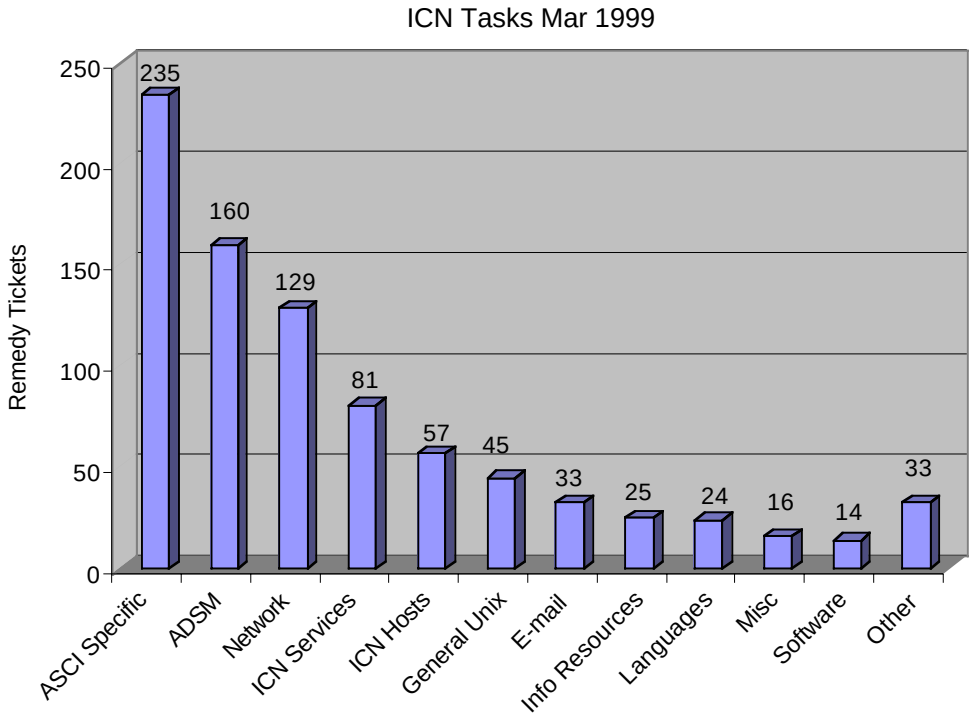


Figure 1.1-20. Remedy statistics for March on the number of problems (tickets) per network element indicated that ADSM was eliciting an unusually high number of calls for an off-the-shelf product.

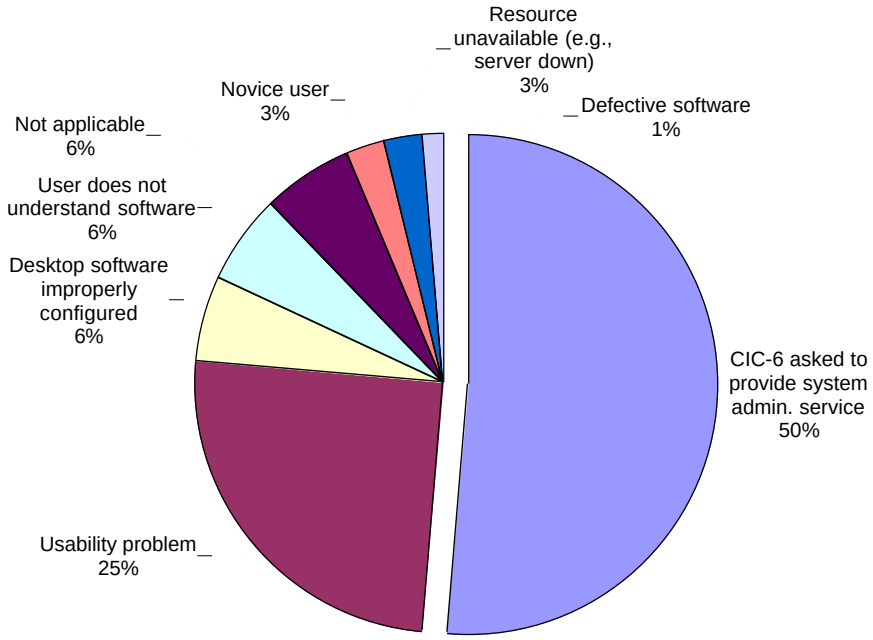


Figure 1.1-21. A breakdown of the causes for ADSM problems indicated that inadequate system administration and a general lack of understanding of how to use ADSM accounted for 75% of the service calls we received on the backup system in March.

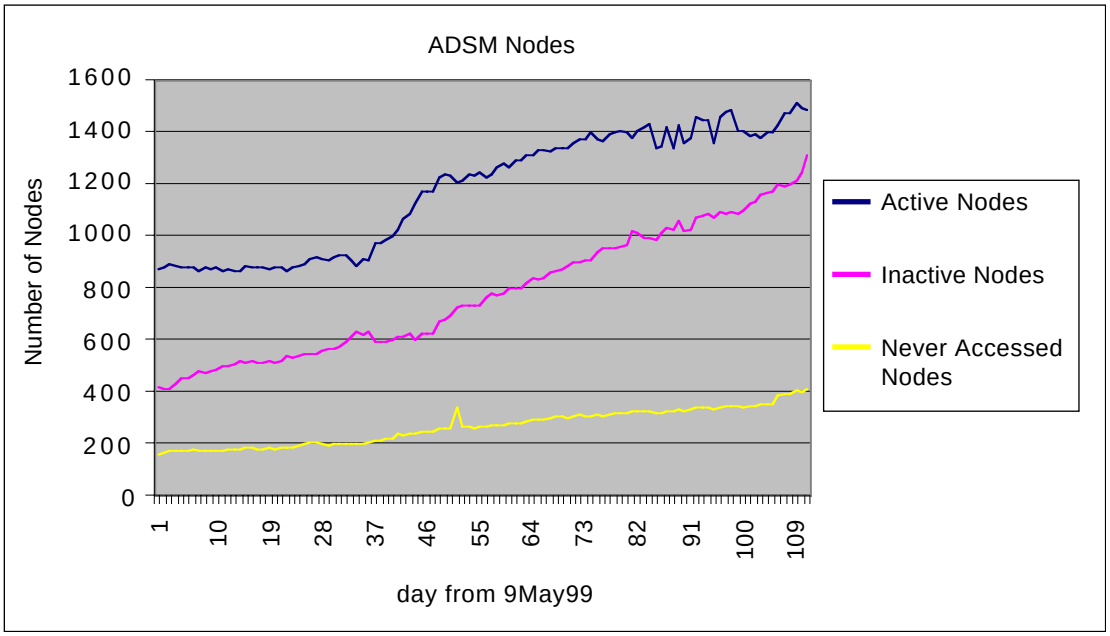


Figure 1.1-22. Further analysis of Remedy data revealed a low rate of effective vs ineffective ADSM users. The fact that the growth of inactive and unused nodes matched that of active nodes—and that their sum grew to exceed active nodes—indicated that we were signing up customers for a service that was not useful to them.

Network Traffic

Los Alamos has an extensive computer network that interconnects all Laboratory sites. Given the nature of the research at Los Alamos, extensive work has gone into building a high-performance, reliable backbone network to support all user requirements, from PCs to the high-end supercomputers used by the Accelerated Strategic Computing Initiative (ASCI). Figure 1.2-23 shows aggregate traffic on the unclassified network backbone since December 1995. Network traffic is now starting to exceed 600 gigabytes per day, compared with approximately 450 gigabytes per day just a year ago.

The Laboratory standard for network upgrades or new installations has been updated in the past year. Connections from the backbone network to the local area network (LAN) have been increased from fast ethernet (100 megabits per second) to gigabit ethernet (1,000 megabits per second). Similarly, network connections to the desktop have been increased from switched ethernet (10 megabits per second) to fast ethernet.

To keep up with the increasing network capability and traffic, we have completed a next-generation backbone project to assess needs, write specifications, and competitively procure a switched, gigabit ethernet infrastructure. The project included an extensive market survey and a survey of major Lab network customers on their projected needs over the next five years. The new gigabit ethernet switching routers will be purchased in two phases, the first in FY99 and the second in FY 2000. We have already begun to install the first switching routers; gigabit ethernet feeds to T and ESH Divisions are now in place, and similar service is planned for X Division by the end of September.

The LANL-Net project is continuing with the goal of a Laboratory-wide “fiber to the building, category-5 twisted pair to the desk” architecture. In FY99, over 1,400 offices were wired with category-5 and provisioned with fast ethernet service to the desktop. Through projects like LANL-Net and the ongoing efforts of Los Alamos network engineers, we continue to provide the highest bandwidth possible to serve the needs of all users of the Laboratory’s computer network.

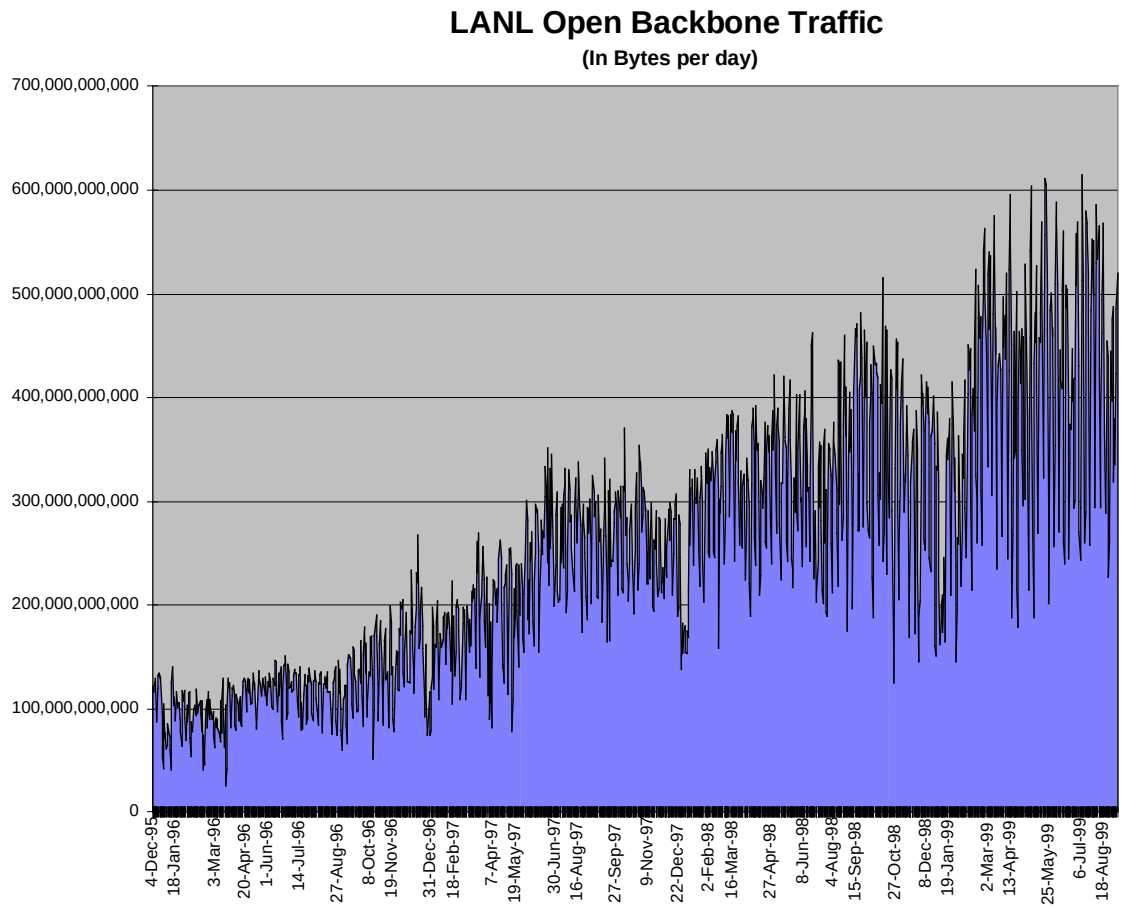


Figure 1.1-23. Computer traffic over the Lab's backbone network has steadily increased over the years, with the three major dips coming in late December when the Laboratory closes over the holidays.

Information Storage and Retrieval

CIC-15 supplies the Laboratory and the DOE complex with a number of Web-based applications that enable users to report, track, manage, search, and retrieve information online. FY99 development and use of three major applications—Explorer, Remedy, and RevCom—are reported below.

Explorer

Explorer is a Web-based application developed by the CIC-15 INDEX (institutional data exchange) team. Explorer provides full-text search and retrieval as well as enhanced knowledge sharing capabilties for many databases, document collections, archives, and Web sites. Noteworthy projects supported by the Explorer application include the following:

- The Laboratory's Nuclear Weapons Archiving Project and several related activitities depend on Explorer to provide access to many different information sources and media in order to sustain stockpile stewardship activities. In addition to the Nuclear Weapons Archiving Project, Explorer is also the primary interface for information retrieval for the LANL/Xerox CRADA, the Central Weapons Information Center, and several stand-alone information sources throughout the Laboratory weapons community.
- Most of the information products delivered by the Library Without Walls Project use Explorer as the primary interface for searching and retrieving information from dozens of sources containing tens of millions of records.

- Following the success of the DOE Directives on Explorer—which saved the DOE over $350K in FY98—most of the Laboratory's internal policies, regulations, and operational requirements are now published online exclusively through the Explorer application. With Explorer's advance notification feature, users of the DOE Directives and LANL Operational Requirements can now develop customized "alert" services for themselves. They create individual profiles (search strategies) that define policy and regulatory areas of interest to them and are then notified electronically when new material related to those areas is published.
- Released at the end of FY98, the DOE Information Locator is one of the newest Explorer applications and is the official government information locator site (GILS) for the entire DOE complex. GILS is the portal through which other federal agencies and the public gain access to information published throughout the DOE complex. With over 60 major Web sites currently registered, GILS has become the primary source of searchable information about the activities of the DOE and its laboratories.

Remedy

CIC-15's Remedy team builds Web-based action-tracking and issues-management applications that support a wide array of operational activities at the Laboratory. In support of integrated safety management at the Lab, we developed an application that enables managers and employees to report, track, manage, and resolve safety issues in real time, without the delays and distribution problems inherent in paper-based tracking systems. Because of the proven reliability and success of our tracking systems, the Plutonium Facility at TA-55 has implemented an issues-management system that we developed to track and report accidents and incidents, radiological incidents, readiness findings, and other safety and performance measures for the entire facility.

RevCom

Since its release in the third quarter of FY98, the Web-based online Review and Comment System (RevCom) developed by our CO2 (components and object oriented) team has successfully managed the entire review process for twelve draft revisions to the Laboratory's Administrative Manual. Hundreds of Lab employees have used RevCom to express their opinions on a variety of issues, including collective bargaining, alternative work schedules, and performance management. RevCom's successful implementation enabled the Human Resources (HR) Division to meet a critical performance measure by giving Lab employees an easy way to provide meaningful and timely input to overall Laboratory administration.

LOCATES/CLOCS

The Laboratory Official Correspondence Automated Tracking Electronic System (LOCATES) is the unclassified computerized document management system used to track senior management correspondence. LOCATES provides full-image access to documents and is the tracking mechanism for managing action items for senior managers. This system also was designed with the goal of transmitting electronic copies of documents to specified recipients, eliminating the need for paper copy distributions. Future uses for LOCATES include electronic access to other Laboratory records, interoffice collaboration, e-mail integration, and integrated security.

The Classified Official Correspondence System (CLOCS) is the classified edition of LOCATES. CLOCS, which became operational in June, is used for handling classified documents up to the Secret Restricted Data level and category and for all Sigma categories with the exception of Sigma 14.

LOCATES and CLOCS provide the Laboratory with a large-scale document management, distribution, and workflow system. They provide tools for scanning paper documents, for entering both electronic documents and related metadata, and for searching. These systems also provide the means for logging and routing documents to offices and individuals. Ultimately, they will provide online access to a broad range of institutional information for senior managers and the legal staff. Both systems are Y2K compliant.

Product Realization Team for Knowledge Management

A major IM achievement this year was the initiation of a product realization team (PRT) for knowledge management within the Nuclear Weapons Directorate. CIC Division played a major leadership role in establishing this team.

Under CIC guidance, the Nuclear Weapons Program initiated the PRT to develop a plan for managing its information and knowledge as a strategic asset. A PRT (industry often calls such a team a joint application development, or JAD) has a specific objective and uses modern quality tools and techniques to achieve that objective. The new PRT came up with a unifying vision for the Nuclear Weapons Program and with critical success factors and objectives for a five-year plan for information and knowledge management. It also produced a detailed action plan that was approved by weapons directorate managers.

The PRT, which represents the whole Nuclear Weapons Program, reached consensus on all of its findings. The team's preliminary report presented compelling arguments as to the need for an effective information and knowledge management system to support program decisions. The report acknowledged that while individual efforts are underway within the Weapons Program to preserve and manage information and to promote knowledge sharing, there is an urgent need to move beyond this fragmented approach. The team's five-year plan is not only achievable within the Laboratory, but also extensible to the whole nuclear weapons complex.

LANL/Xerox Knowledge Management CRADA

On July 14, 1998, Los Alamos and the Xerox Corporation signed a cooperative research and development agreement (CRADA) to develop a state-of-the-art knowledge management system for the Laboratory. This system will be used to provide weapon design and production information essential to the Lab's science-based stockpile stewardship mission. The five-year CRADA will follow a phased approach. Early phases will develop a system to handle legacy data, with later phases devoted to managing the flow of information, such as transferring knowledge from current to future generations of weapon scientists and engineers.

The Central Weapons/Production Information Center (CWIC) of CIC-10 was selected as the Laboratory organization to pilot the knowledge management system being developed. CWIC is responsible for managing 24 million pages of weapon-related documents, including over one million aperture cards and three million radiographs. The CRADA project will expand to include weapon-related records located throughout the Laboratory by establishing links to other information systems. The long-term goal is to link the Los Alamos system to similar knowledge management systems throughout the DOE complex.

Second year accomplishments of the project include the following:

- Modifying SM-39 to provide a greatly improved facility for storing and processing CWIC records and moving CWIC records to the new facility (see Figure 1.1-24).
- Purchasing knowledge management system equipment (first phase).
- Developing a prototype for aperture card processing. The architecture for this prototype included image extraction functionality for automatic capture of information on the aperture cards.
- Developing a plan for data enhancement that focused on reducing the effort to capture metadata for documents by linking to other information sources that contain related information.
- Implementing the repository strategy, which includes using Explorer for the database and search tools.
- Developing the high-level architecture for a federated information system environment that allows for information sharing across organizations and distributed information bases.
- Developing weapon-system tree maps that identify subassemblies and parts for the B61-7, W76, and W88.
- Investigating possible use of a Xerox beta product, called Content Guard, as a partial solution to the Laboratory's information security issues.
- Selecting and beginning to modify an area in the basement of SM-43 for document capture operations.

Before After

Figure 1.1-24. Photos of SM-39 facility modifications.

Information Architecture Project

In its sixth year, the Information Architecture (IA) Project continued to adopt Lab standards for computer software and hardware interoperability, network management, and information security through customer participation, open processes, and voluntary compliance. In FY99, IA efforts were primarily focused on preparing the Laboratory for the Year 2000 (see discussion under Criterion 1.3) and enhancing information security. Other IA initiatives included creating a Linux subteam and survey, conducting a third annual Web-based customer survey and baseline interviews with mid-level managers, establishing network domain and other naming conventions, expanding Web standards to cover XML (Extensible Markup Language) and multimedia, and investigating products such as Microsoft Office 2000 for future adoption as IA standards.

Computer Security

IA contributed to the new Laboratory-wide security initiatives by sponsoring three forums on information security, adopting a variety of standards related to computer security, and publishing a series of articles on information security issues. The forums covered Intel's security measures, encryption tools, and desktop threats and protections. Before the first forum, Intel security managers also met with Laboratory security officials in a private session.

The IA team collaborated in designing and implementing the new unclassified network firewall. The firewall's design was based on IA standards for the unclassified network security model, which has since been upgraded and incorporated into the Laboratory Unclassified Network Security Plan. We issued requests for help (RFHs) for dial-in modem security changes and for ways to merge the Administrative Partition into the Unclassified Protected Network; the results of these RFHs contributed to eventual changes in security practices and standards. We wrote *BITS* articles explaining the firewall and how to use it, including instructions for authenticated crossing of the firewall to maintain connections to external collaborators. A follow-up standard and *BITS* article addressed Virtual Private Network (VPN) access to the Unclassified Protected Network, which was a topic in our second security forum.

IA Standards

A number of IA security standards, originally issued as guidance, have been incorporated into Laboratory security policies. Among current IA security standards are the following:

IA-6C01: Laboratory Unclassified Net Security Model
IA-6C02: Login Access to Laboratory Unclassified Networks
IA-7101: Access to Laboratory WWW Servers
IA-7103: Dial-in Modem Access to the Laboratory Unclassified Protected Network
IA-7201: Access from Laboratory Unclassified WWW Clients
IA-7401: FTP Access to/from Laboratory Unclassified Networks
IA-7701: Generic TCP-Based Client-Server Security Model
IA-7A01: Network File System (NFS) Security
IA-9301: Virtual Private Network (VPN) Access to the Laboratory Unclassified Network
IA-8802: Encrypted File Transfer via Protection Regime 3 Web Server
IA-6303: Electronic Information Protection Regimes
IA-6304: Detailed Listing of Electronic Information Types
IA-8307: Standard Unclassified Data Encryption Protocol (DES)
IA-8308: Secure Sockets Layer v3 (SSL v3)
IA-8311: Secure Shell (SSH)
IA-8312: Laboratory Standard Kerberos
IA-8314: Advanced Encryption Standard (AES)
IA-8315: Secure Domain Name System (DNSSEC)
IA-8B01: Standard Password Protection for Desktop Computers

IA continued to investigate new Web technologies for inclusion as future Lab standards. New Web standards during FY99 addressed XML, Web multimedia delivery, and Web content accessibility. Web-related IA articles in *BITS* addressed portable network graphics, the next-generation markup language (XHTML), and Web content accessibility. Tad Lane, IA Web team leader, spoke on Web content architecture at the IntraLab99 Web Conference. In addition, we took the lead in addressing the new Web page markings required by DOE to alert users about monitoring policies.

Desktop Standards

The IA Desktop Standards team studies and recommends standards and upgrades for commonly used hardware and software personal productivity tools. The team has a membership of more than 25 expert computer users and computer technical support staff from across the Laboratory. In FY99, the team's activities included the following:

- Adopted the Adobe suite of tools for Laboratory forms, replacing JetForms, and revised hundreds of forms in cooperation with CIC-13, which develops and manages Laboratory enterprise computing. Forms at the Laboratory are now easily fillable and exchanged, and information in forms can be saved to databases and used as institutional knowledge.
- Formed a Linux subteam with a membership of primarily scientific and technical Linux users. The team's goal is to address the future of the Linux operating system at the Laboratory and whether or not IA could guide that future to ensure standardization. During May and June, the Linux team surveyed current and planned Lab use of Linux. Survey results indicated that i386 is the most prevalent Linux architecture (+60% for both workstations and servers) and that RedHat (68%) is the most widely used version of Linux.
- Issued an operating system white paper that advised Lab Microsoft Windows users to plan on migrating from Office 95 to NT, without installing Office 98.
- Contributed to Laboratory security initiatives by researching desktop screen saver products and proposing IA-8B01: Standard Password Protection for Desktop Computers, which was adopted as an IA standard on January 20.
- Established an alliance with Intel Corporation that included (1) a February benchmarking meeting with Intel's CIO on how Intel manages desktop computers, (2) Intel's donation of an 8-way P3 Xeon server to the Lab, and (3) Intel speakers for the first IA security forum.

CIC Distinguished Performance Awards

CIC staff were honored as members of three large teams and one small team that received Laboratory Distinguished Performance Awards for outstanding achievements in 1998. Award recipients were nominated by their by colleagues, screened by a nomination review committee, and chosen by Director John Browne.

Fourteen individuals, eight small teams, and ten large teams were named 1998 award winners. The individuals and small teams made unique contributions to the Laboratory's programmatic efforts and had a positive impact on the Laboratory's status in the scientific community. The large teams brought distinction to the Laboratory by completing projects that resolved significant problems and/or made Los Alamos the recognized expert in a field. The three large teams with CIC members were the ASCI Blue Mountain, Data Visualization Corridor, and Network Firewall teams; the LANL-All E-mail team won as a small team.

Los Alamos ASCI Blue Mountain Team

The Department of Energy ASCI program was defined in 1994 as an integral part of the stockpile stewardship strategy. This program was to provide the computational tools needed for the assessment and revalidation work of the national Stockpile Stewardship and Management Plan prepared by DOE and the Department of Defense (DoD). The program goals included developing high-performance, predictive computer codes for weapons certification and analysis; stimulating the US computer industry to create more-powerful high-end supercomputers; and creating a computational infrastructure and operating environment for those supercomputers. In October and November of 1998, the Lab's ASCI Blue Mountain team met these program goals ahead of schedule and with far better results than expected.

Los Alamos Data Visualization Corridor Team

The Los Alamos Data Visualization Corridor (DVC) team, working with SGI, recently installed the world's largest scientific visualization capability, consisting of 16 SGI Infinite Reality engines. This multidisciplinary team brought together expertise in the areas of high-performance visualization, high-speed networking, distributed resource management, systems science, virtual reality environments, visualization tool development, synchronous multiprocessor programming (SMP), high-performance input/output, object-oriented programming, volume-rendering techniques, library development, computational physics, procurement support, and project management. Members were drawn from multiple groups within both CIC and X Divisions. Each member of the DVC team brought unique skills and insight to the project; combining their expertise, the team solved unprecedented challenges in architectural hardware and software complexity.

Network Firewall Team

Designing and implementing the unclassified network firewall were significant technical achievements that balanced the needs of strong security and high user productivity. The heart of the firewall is a series of transparent proxy servers developed by the team. The proxy servers are Linux-based computer systems that capture all incoming data traffic bound for the blue (protected unclassified) network and run a series of checks on the data packets before forwarding them. These checks include assurance of strong user authentication with a SecureID or CryptoCard and checks for common buffer overflow or malformed packet hacking techniques. Members of the firewall team wrote both the proxy application software and the Linux kernel modifications needed for the proxy servers to operate at speeds of up to 100 megabits per second (required to keep up with incoming data traffic). The success of the firewall was important to the Laboratory both in terms of keeping intruders out and in convincing DOE and other sponsors that the Lab's unclassified computers and networks are secure. More details on the firewall were given earlier in this report (see Unclassified Computer Network Security).

LANL-All E-mail Team

This small team was tasked with developing an e-mail replacement for paper memoranda sent to all Lab employees. The Director's Office required that the new electronic memoranda reach all University of California and contractor employees regardless of their e-mail capability. There are hundreds of e-mail servers at the Laboratory on many different networks with many different mail clients. The possibility of causing these servers to fail under the weight of large mailing lists was high. The fact that CIC received no complaints from network managers when the lists began to be used indicates the thoroughness of the project's background work. The team saw a need for, and had the dedication to complete, a project that benefited the entire Laboratory.

Publishing Achievements

CD Work

CIC-1 staff help Laboratory customers develop better, more cost-effective communication products, with a growing emphasis on applying electronic publishing tools when they best meet the need. In several instances this past year, we encouraged development of CDs to replace or supplement print publications, reducing both the cost and environmental impact of the Lab's communication products.

We proposed and produced a "Reports Compilation" CD for a Lab customer that was essentially an electronic version of a series of paper reports. The customer saved about $71 per copy by producing CDs rather than a print publication. "Reprints" will save even more—at least $177 per copy. Furthermore, the CD provides greater functionality for the user because it is easier to distribute and has nested menus and a full-text search capability.

Producing these CDs also resulted in environmental "savings." Printed copies of the report would have been 1,800 pages long; the CD thus avoided the use of large volumes of paper and printing chemicals. For this project, the customer nominated our CIC-1 team for a LANL Pollution Prevention Award, which it won. In short, the CD turned out to be a practical, accessible, and environmentally responsible communication product with a 38% cost avoidance over traditional print media.

We realized comparable benefits by producing the Lab's annual "Munitions Report" as a CD. This two-volume report fulfills a DOE requirement; last year, the print run for the two volumes ran over 53,000 pages; this year's report was issued as a CD. Another major annual report, the Lab's two-volume "Science and Technology Assessment," is being produced as both a CD and a print publication. For Vol. I, producing the CD reduced the number of pages printed by 65% (from 29,200 to 10,176 pages). For Vol. 2, the reduction was 72% because we helped the customer rigorously edit the text in addition to producing supplemental CDs. Beyond reducing printing costs, the CDs will also reduce shipping costs for distributing the report.

Web Work

Two years ago, the CIC-1 Web team approached the Human Resources (HR) Division about developing a cross-divisional training catalog for the Lab's internal home page. Coincidentally, HR's Training Integration Office was looking for a way to create an online catalog. The result was a teaming effort that produced the Virtual Training Center, a Web site that offers one-stop shopping and registration for all training classes offered by Lab organizations. The site has been recognized as a standard of excellence across the DOE complex and was lauded this year by HR's external review committee. It is the sixth most widely accessed Web site on Los Alamos servers.

In January, CIC-1 teamed with CIC-14 and -5 to develop a portal for one-stop-shopping for LANL science and technology research. While the Research Library offers a number of online databases that access formally published research, they don't access the growing body of technical information that is published informally on the Internet. To complement these databases, the CIC team developed aha!, a Yahoo®-like directory and search engine that accesses Lab Web pages, technical reports, patents, databases, audiovisual files, and images. In accord with the Lab's new firewall for unclassified networks, there are two versions of aha!—one for the public and one for Laboratory staff. Both are organized around 14 top-level categories: analysis and testing, chemistry, computing/information sciences, earth sciences, engineering, environmental sciences, industrial technologies, international security, life sciences, materials science, mathematics, nuclear sciences, Lab organization and operations, and physics. Users can access information by performing keyword searches on the aha! database or by browsing through the category tree. They can also select "hot links" on the aha! home page and on each top-level category page that take them to key Lab Web sites identified by the aha! team. Released in July, the portal is continually evolving as new sites are added and its category tree is expanded.

This year CIC-1 also took responsibility for developing and conducting IntraLab99, a one-day workshop attended by over 200 Laboratory Web developers. IntraLab99 briefed Web developers about classification issues, authoring tools, and the aha! portal. Participants heard about the basics of developing a Web project and were given guidelines for Web writing and editing. Presentations were also given on user interface issues, navigation and LANL identity requirements, and CIC-1 Web templates. Attendees obtained a Web resource list, watched a

RealMedia demo, and heard about Web content architecture. The workshop was well received, and many requested that it become an annual event.

Benchmarking

Each year, the Lab enters the R&D 100 Award competition, an international search for the top 100 technical innovations of the year, sponsored by *R&D Magazine*. CIC-1 collaborates with technical staff members from around the Laboratory to develop and design entries showcasing Lab innovations. In June, we learned that 7 of our 17 entries won awards—one of our highest winning percentages in many years of competing. In this year's approach to developing the entries, several of CIC-1's staff interviewed potential submitters along with the project's lead customer. Upon learning of the Lab's outstanding results, the customer wrote: "I believe this approach contributed to this year's success. . . . I also want to commend the CIC-1 editing and design staff for an outstanding job."

Our communication products fared well in other professional competitions, too. The Society for Technical Communication (STC) sponsors annual state, regional, and international competitions. At the state level, 13 of our 19 entries won technical publication awards, 12 of 29 entries won technical art awards, and 6 of 7 entries won online communication awards. We also took Best of Show in both the art and publications competitions, and five of our entries qualified for the STC's international competitions.

In the International Technical Publications Competition, two of our entries won the STC's highest award. The *Laboratory Directed Research and Development (LDRD)* progress report and *Nuclear Weapons Technology: Focus on the Stockpile* brochure both won Awards of Distinguished Technical Communication. Two entries in the art competition won Awards of Achievement. Also, one of our editors was selected this year to judge in the international publications competition.

In a competition sponsored by *Graphic Design: USA* magazine, CIC-1 designers won four American Graphic Design Awards for several posters and a brochure. This nationwide competition received about 10,000 entries in 1999, of which less than 7% received awards.

In recognition of our Web work, *Popular Science* listed the Lab's external Web site, designed and maintained by CIC-1, among its top 50 science sites. The Lab's companion internal home page is the most-accessed site on LANL servers, receiving over 50% of all requests.

Finally, in June 1999, CIC-1 began a first-time benchmarking exercise with a best-in-class private-sector company. EEI Communications provides communication products and services to government agencies and private businesses in the Washington, D.C., area. Two managers from EEI spent a week at our site, interviewing staff and assessing our processes, products, and structure. In July they gave us their assessment and recommendations for improvement. CIC-1 managers and staff will use this report to improve the group's structure and processes, with a goal of increasing cost efficiencies and customer service.

Video Awards

Three members of CIC-9's Video Imaging team won awards at the 40th Annual International CINDY competition in March. CINDY, which stands for Cinema In Industry, is an industrial film competition that was launched in 1959. It is sponsored by the International Association of Audio Visual Communicators, a nonprofit group that represents theatrical, broadcast, nonbroadcast, and interactive media professionals worldwide.

Top-level gold CINDY awards were given to Fred Baker in the "recruiting" category for *A Wild Fire Prediction System* and to Warren Young in the "museum" category for *The Living Brain*. Mike Kuchinsky won a silver CINDY award in the "technical information and scientific research" category for *Directed Light Fabrication*. CIC-9's winning videos were selected from 2,700 videos that were entered in the competition.

Fred Baker also won a 1998 Aegis Award for writing and directing *Bulging Drums: What Every Responder Should Know*. Aegis Awards are a video industry competition that recognizes outstanding video production and nonnetwork television commercials.

CIC Community Outreach

CIC-2 Educational Outreach

CIC-2 staff are involved in several outreach projects that support computer technology and education in northern New Mexico, three of which are summarized below.

- **EDUNET Award**. We received an award this year for our support of EDUNET, a Laboratory outreach program that is connecting schools in New Mexico to the Internet. The program provides equipment, training, and consulting services for some 30 school districts throughout the state. For the past five years, CIC-2 personnel have done most of the field work and training for this program.
- **THEA Internship**. We are in the second year of sponsoring a Tri-County Higher Education (THEA) System Administration Internship. This internship provides opportunities for computer science students enrolled in member schools (Northern New Mexico Community College, Santa Fe Community College, and the Los Alamos branch of the University of New Mexico) to work part time at the Lab in the field of system and LAN administration. We have two interns continuing in the program from last year and two more will join the program this coming year. Upon successful completion of their studies and the internship, these students are eligible for regular employment at the Lab. The internship provides valuable work experience for the students and valuable recruiting opportunities for the Lab.
- **Summer Interns**. We also sponsored student/faculty summer teams from local colleges not in THEA. This year we supported two teams of three students and a faculty member. We also mentored two Española High School teachers to help them gain experience in system and LAN administration so that they can better structure a vocational program their school provides in this field.

Adopt-a-Family Project

CIC-13 coordinates a voluntary project to raise money for adopting five area families during the Christmas holiday season. This year we raised approximately $4,000. The money was used to purchase at least one “big ticket” item (i.e., refrigerator, washer, dryer) for each family, three gifts for each family member, a stocking for each child, nonperishable food, and gift certificates to local restaurants.

Performance Assessment

To achieve the rating of “outstanding,” our operational effectiveness must achieve external recognition or be best in class. In various areas we have demonstrated both characteristics and therefore feel we rate as “outstanding” in this area:

- Our financial performance is clearly best in class.
- Our desktop services have been benchmarked as less costly than the industry average, and our costs are increasing much more slowly than the industry rate.
- Our Research Library and Library Without Walls Project are benchmarked, visited, and recognized the world over.
- Our communication and video products have won prestigious national and international awards.

Criterion 1.2—Customer Focus

IM products and services meet customer requirements. (Weight = 30%)

Performance Measure 1.2—Level of Customer Satisfaction

Evaluation of customer satisfaction reviews and implementation of activities toward improvement. (Weight = 30%)

Assumptions

Measurement deliverable—results of customer satisfaction reviews.

Gradients

Good—a systematic approach to the measurement of customer satisfaction; evidence of meeting commitments to customer requirements.

Excellent—cost-effective and/or innovative approaches to measuring customer satisfaction, customer involvement throughout the life cycle of IM activities, and evidence of improvement in customer satisfaction.

Outstanding—sustained high level of customer satisfaction.

Performance Measure Results

CIC Division groups and projects have a long track record of conducting customer satisfaction surveys and using the resulting data to develop products and services that meet changing customer requirements. We also continue to explore new ways of assessing those requirements. This section covers our FY99 work in both developing survey techniques and applying them:

- Information Storage and Retrieval
- Desktop Support
- Research Library
- Communication Arts and Services
- Imaging Services
- Records Inventory
- IA Standards
- Baldrige Self-Assessment
- CIC Division's External Review Committee

Information Storage and Retrieval

Assessing the needs of division customers and their satisfaction with the products and services we provide were the original drivers behind CIC-15's development of the Surveys and Metrics System. This Web-based tool enables survey designers to quickly create and deploy surveys on the Web *without* the help of a programmer. We have seen an increase in the use of the Surveys and Metrics System, particularly in the areas of Baldrige Award self-assessments and voice-of-the-customer activities. By August, the system had been used to develop some 20 surveys, compared with just 4 in FY98, and requests for the Web tool are continuing.

Desktop Support

The Desktop Group (CIC-2) collected customer satisfaction data for a third year in FY99. Survey results indicate that customer satisfaction with our staff members continued to increase (Figure 1.2-1), although our desktop services had mixed results this year (Figure 1.2-2). Our successes reflect continuing efforts to stabilize desktop support by putting a priority on reducing attrition and hiring exceptional staff. This focus helped improve our response to both contract and noncontract support requests and was evident in our staff's improved timeliness rating. Our increased software offerings through ESD also met with customer approval.

As mentioned under Criterion 1.1, CIC-2 also took on desktop and LAN support responsibilities for two more Lab divisions this year—Materials Science and Technology (MST) and Applied Theoretical and Computational Physics (X) Divisions. These acquisitions increased the number of desktops and servers that our group manages by 25% (about 2,000 new desktops were added).

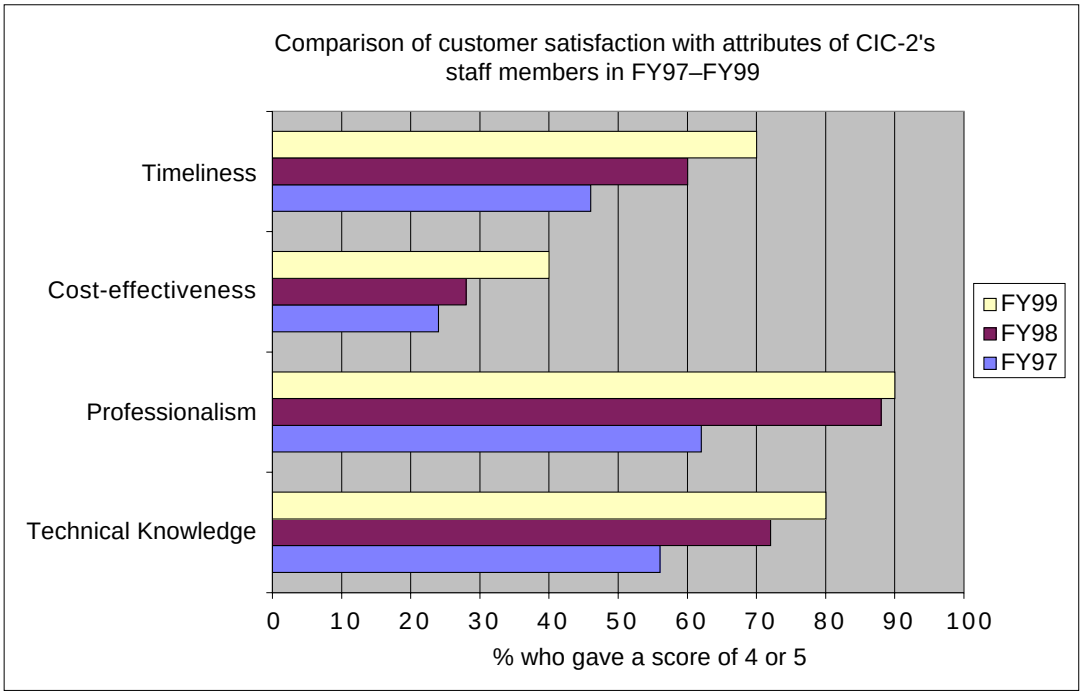


Figure 1.2-1. Trends in customer satisfaction with CIC-2 staff.

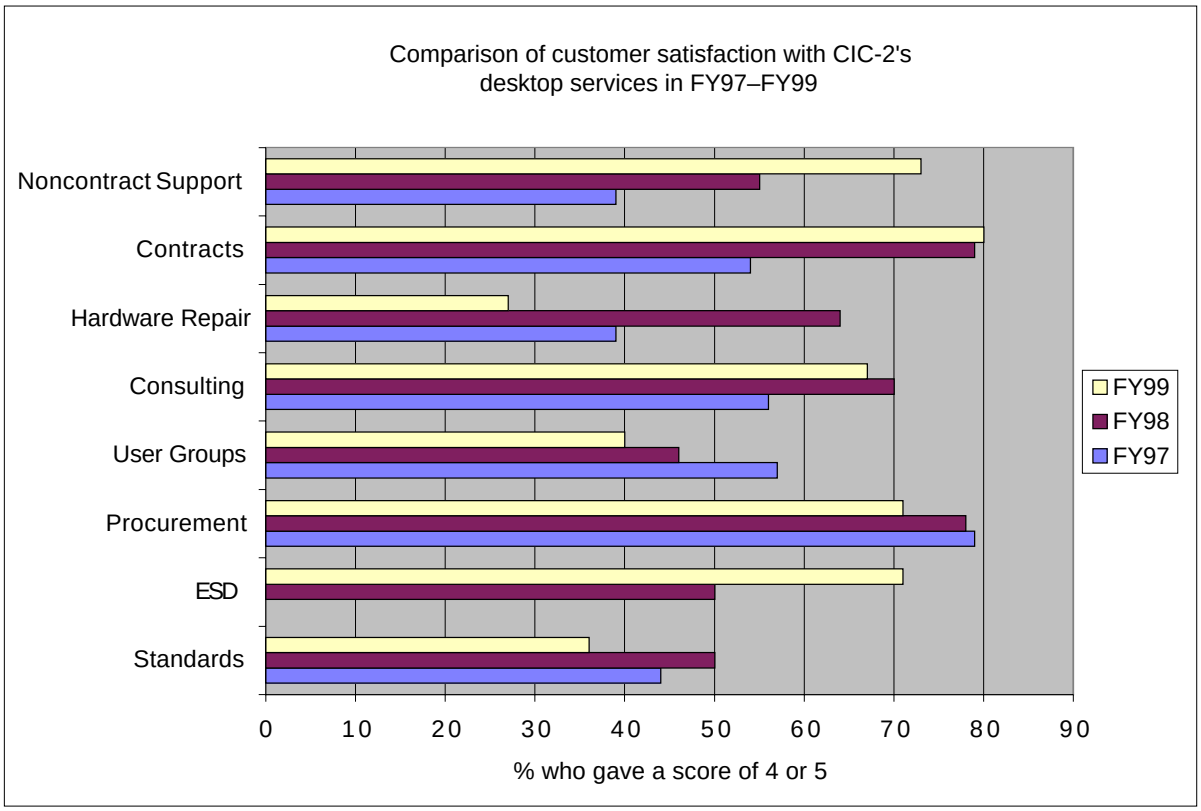


Figure 1.2-2. Trends in customer satisfaction with CIC-2 desktop services**.**

On the downside, we had problems this year with our outsource contractor for hardware repair and ended up canceling the contract, which is reflected in declining customer satisfaction with repair work. We also lost ground in the areas of standards, consulting, and procurement. The decline in procurement satisfaction may reflect the fact that we were not as aggressive this year as we were a year ago in advertising the potential software savings available Lab-wide through the ESD program. The areas of desktop standards and consulting are managed by the IA Project and CIC's Customer Service Group, respectively; however, their declines in customer satisfaction merit closer scrutiny, and we'll develop action plans to address them. Finally, although we worked to improve the frequency and content of our user groups this year, we clearly have more work to do to increase customer satisfaction with them.

Research Library

At the Research Library (CIC-14), our customers play a key role in our success. We collect a variety of customer and market data that then feeds into our Strategic Business Management system. As in past years, the number of Laboratory employees who use the Library continued to increase: we had more than 4,800 internal customers in FY99, up from 4,350 in FY98. Their satisfaction with our services also increased.

We send a quarterly Web-based survey to our customers to determine both their needs and their satisfaction with how we meet those needs. As shown in Figure 1.2-3, the percent of customers who were satisfied or delighted with our products and services continued to rise over the past year.

Figure 1.2-3. The Research Library has had a steady rise in customer satisfaction (dashed line shows upward trend).

Communication Arts and Services

For the last three years, CIC-1 has conducted Web-based customer satisfaction surveys. However, because the surveys have indicated consistently high levels of satisfaction with our products and services but have had falling response rates, we questioned their continued value in providing input for our strategic and operational planning. We felt that interviewing customers might yield more specifics for planning and might also help us build better customer relationships.

This year, our Communication Products Focus Team, a joint CIC-1 and CIC-9 team, pilot-tested a series of interviews with key customers. Based on this test, we plan to interview a larger set of major customers this fall, with the goal of profiling the requirements of different customer sets, their satisfaction levels, and their expectations of future needs. The results will then be used to develop group strategies, objectives, and metrics.

Imaging Services

In FY99, CIC-9 undertook a comprehensive Web-based survey to learn how satisfied customers were with our major product lines and how important those services were to them. We asked for their overall satisfaction with our four print plant services—

1. In-house printing (electronic FTP submittal of documents, brochures, reports),
2. In-house duplicating (from hard copy originals, oversize originals),
3. Print plant bindery (perfect binding, spiral binding, velobinding, drilling, stapling, etc.), and
4. Government Printing Office (vended printing for 4-color, quick-turnaround, low-cost, and specialty items).

We also asked them to rate these services in terms of cost, timeliness, error rate, quality, value added, and impact on freeing up their time for other work.

In addition, we asked customers to rate our photograpy, video, and document imaging services. We maintain a staff of professional photographers, operate a photolab for processing electronic and conventional images, develop and produce videotapes, maintain extensive film and video footage, and supply audio-visual support for two Laboratory auditoriums. In our imaging services, we offer micrographics and specialized scanning services and operate PAGES (Print and Graphics Express Station), the digital imaging and media output node for the Lab's Central Computing Facility.

The survey results were quite positive. With a return rate of 17%, respondents rated the importance of, and their satisfaction with, our services as high. Figures 1.2-4 through 1.2-7 show the survey data. Because this survey was our first, we have no historical trend data to report this year. The survey will be repeated next year to begin building such data.

In addition, we surveyed writer-editors in the Communication Arts and Services Group, CIC-1, regarding the usefulness and importance of our Xerox Docutech printing service. As part of our authorized in-house print plant, we lease a Xerox Docutech 6180. While excellent in quality and turnaround time, this service is costly to maintain. Overwhelmingly, however, the CIC-1 respondents said that the service should be maintained.

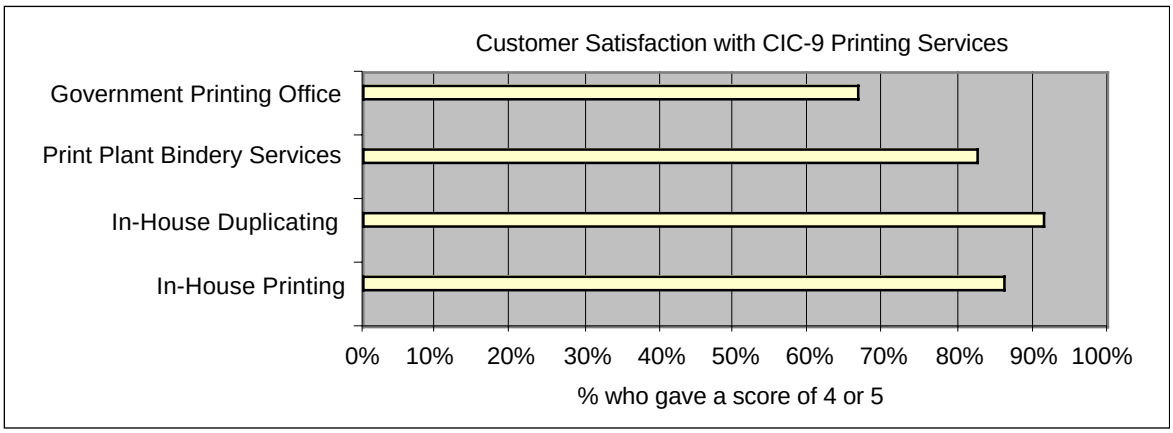


Figure 1.2-4. Overall customer satisfaction with CIC-9's printing services.

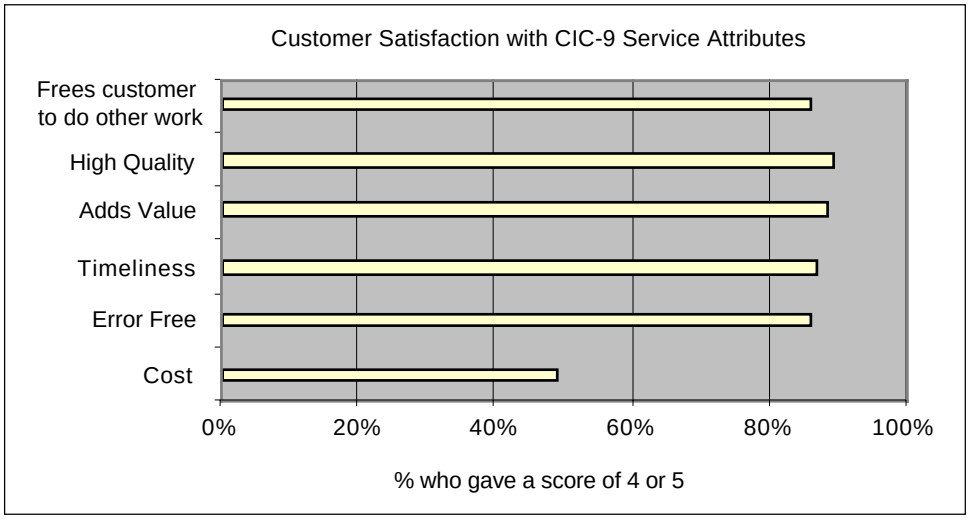


Figure 1.2-5. Customer satisfaction with specific aspects of CIC-9's printing services.

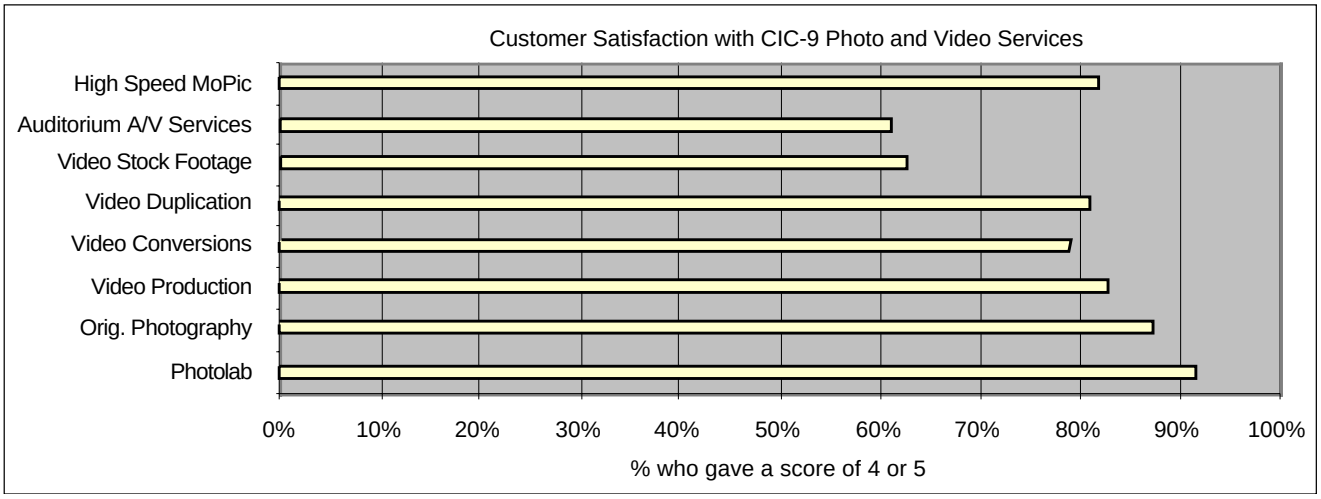


Figure 1.2-6. Customer satisfaction with CIC-9's photography and video services.

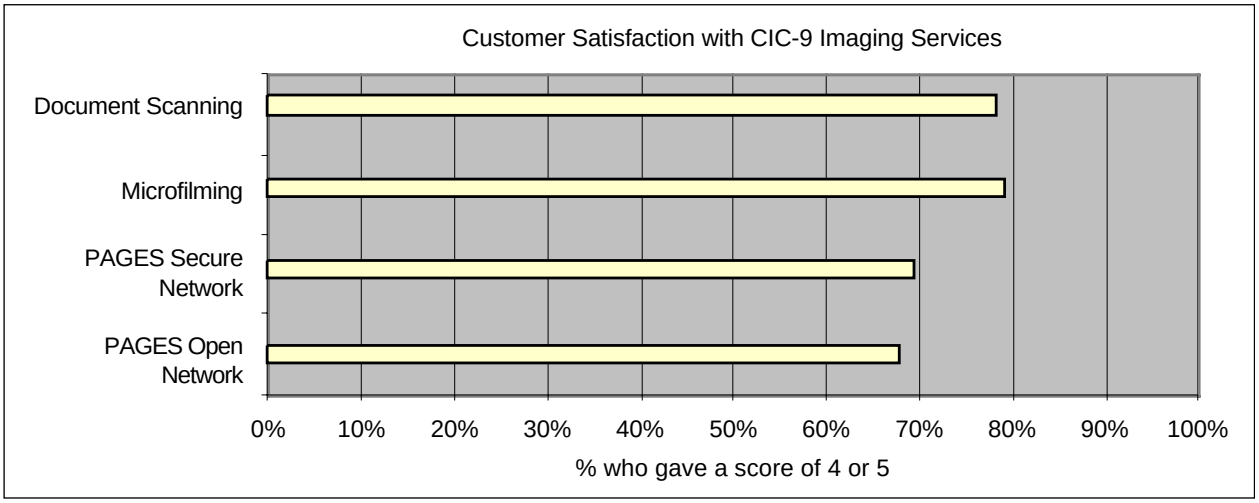


Figure 1.2-7. Customer satisfaction with CIC-9's document imaging services and PAGES.

Records Inventory

Concern for customer satisfaction with CIC-10's records inventory project remains high. Our customer survey, which is conducted quarterly, measures satisfaction with the inventory's purpose, the professionalism of our staff, the inventory form (which helps us identify records series), the status of the inventory, the timeliness of its completion, and overall customer satisfaction. Figure1.2-8 compares the results of FY98 with the results received through the third quarter of FY99.

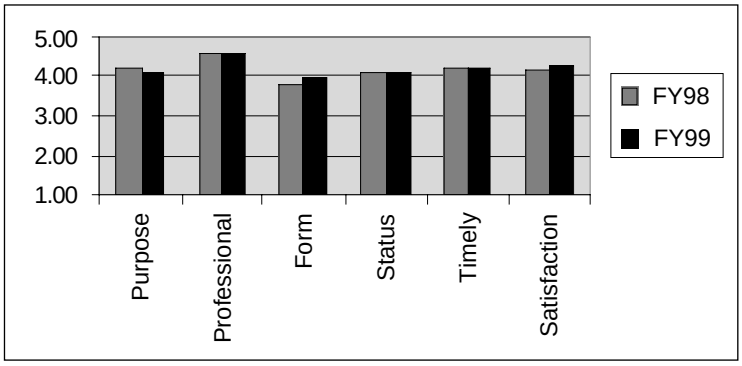
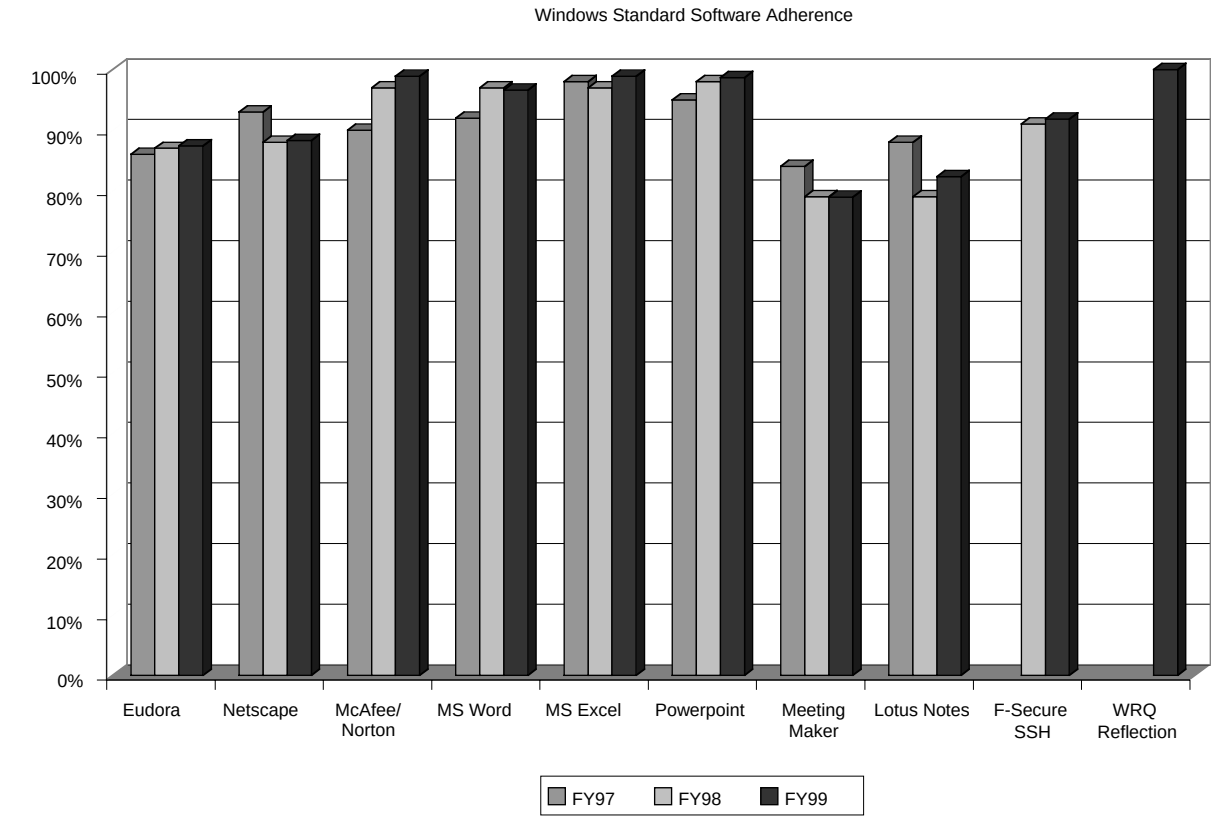


Figure 1.2-8. Customer satisfaction with the Records Inventory**.**

IA Standards

The IA Project conducted its third comprehensive customer survey in July, and 452 responses were received from a random sample of 1,600 customers. Survey data indicate that customers continue to adhere to IA software standards (Figure 1.2-9), that their satisfaction with IA Project efforts is sustained (Figure 1.2-10), and that they believe that standards are being adopted by the project in a timely manner (Figure 1.2-11). A baseline on managerial understanding and use of IA standards was begun with a series of personal interviews conducted by IA Review Team members.



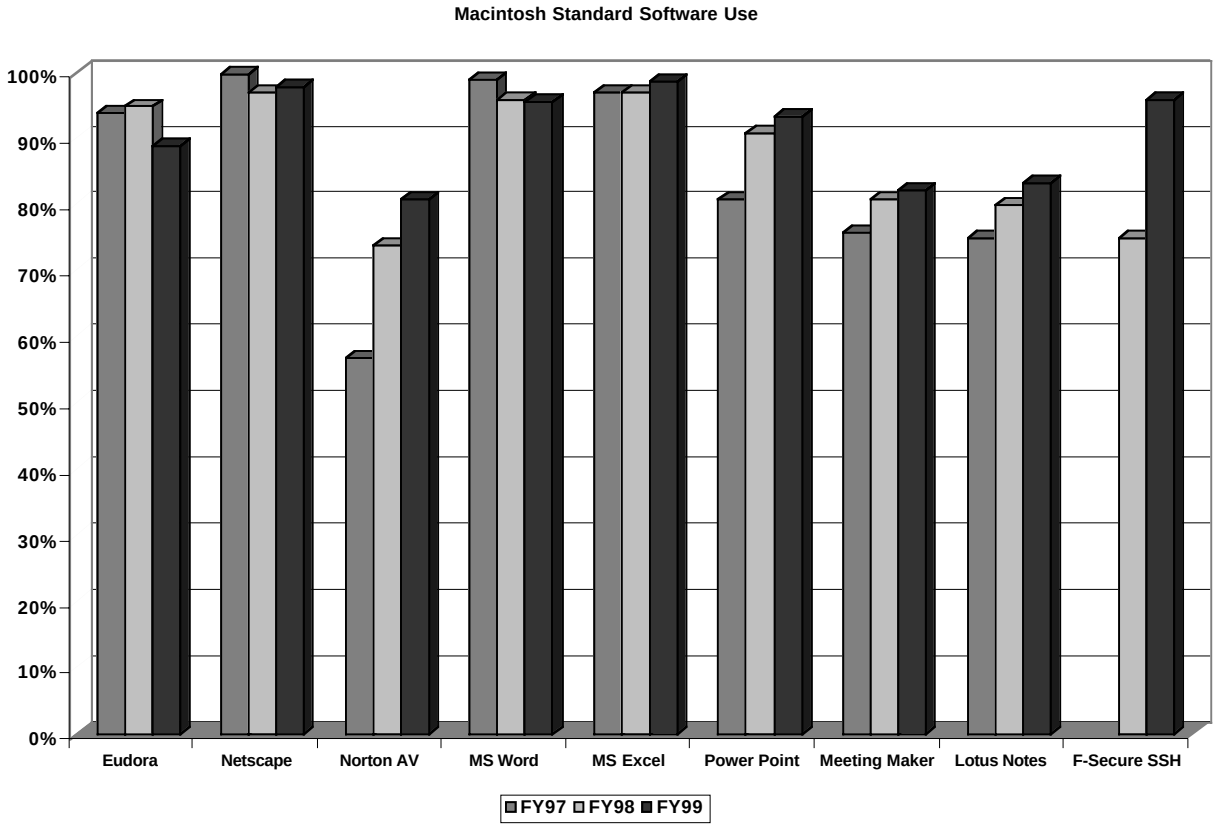


Figure 1.2-9. Customer adherence to Windows (top) and Macintosh (bottom) software standards.

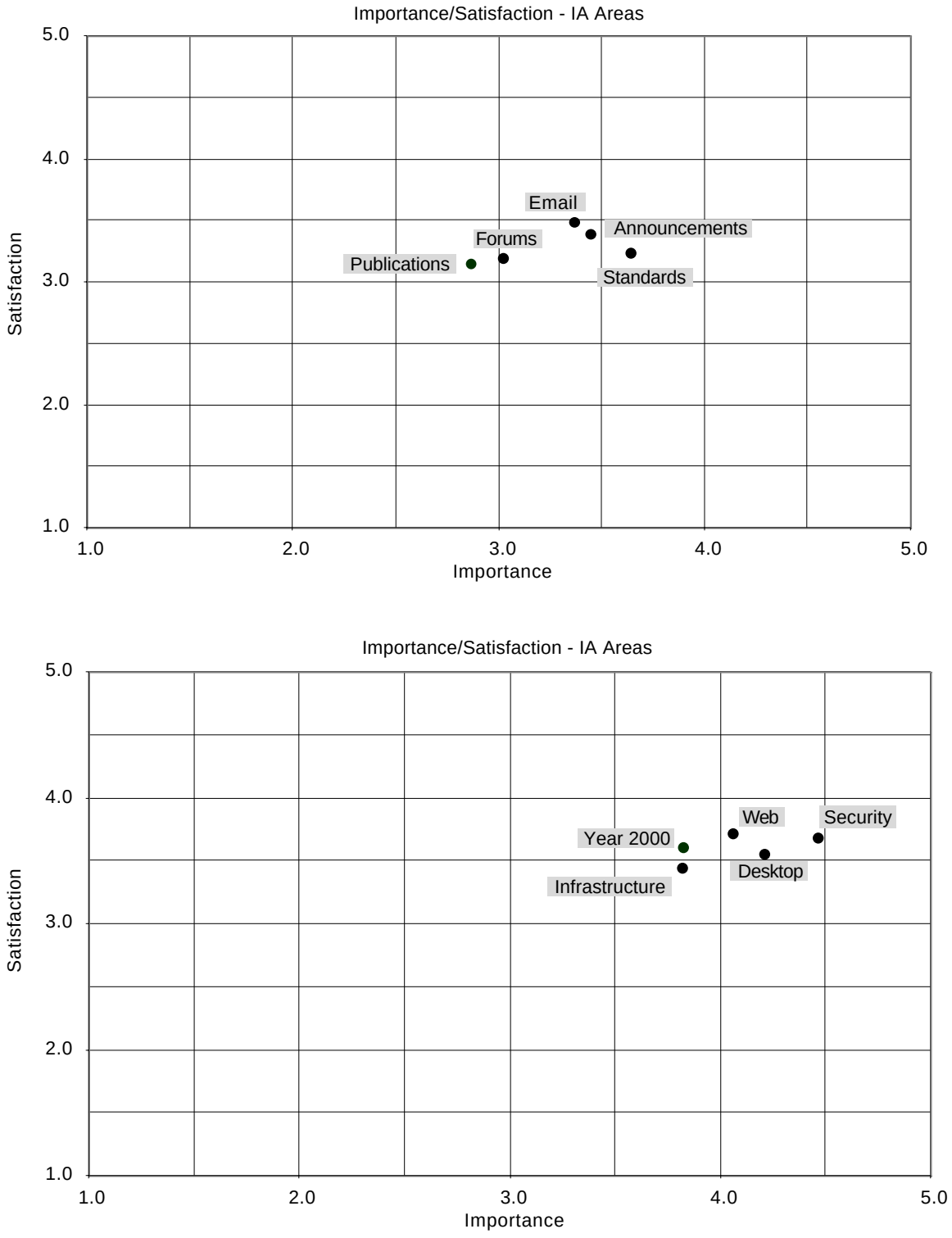


Figure 1.2-10. FY99 customer satisfaction with IA Project activities (top) and subject areas (bottom).

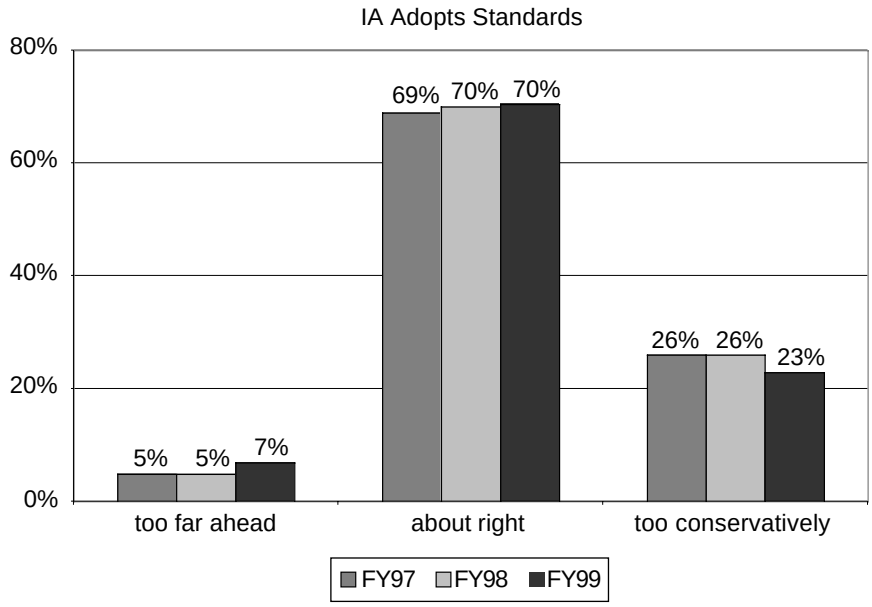


Figure 1.2-11. Customer satisfaction with the timeliness of IA standards.

Baldrige Self-Assessment

For the third year, CIC Division did a self-assessment following the Baldrige Award methodology. The process included distributing Baldrige surveys to 75 people, who formed a cross section of CIC managers, staff, and customers. An outside contractor scored and evaluated the surveys. We also held an all-day meeting with survey respondents to gather anecdotal input in addition to the structured data provided by the survey.

The results of this exercise are shown in the following tables. The division's total score on the assessment (Table 1.2-1) has risen steadily since 1997, indicating that we are making progress in the areas evaluated by the survey (see Table 1.2-2). The ratings the division received from CIC staff and customers have also risen significantly in this time frame (Table 1.2-3). The ratings given by our own managers recovered from last year's drop and returned this year to near-1997 levels (Table 1.2-4). Finally, it is noteworthy that over the three years that we've conducted this assessment, we have reduced its cost by nearly half—from $95,000 in 1997 to $50,000 in 1999.

The results of the Baldrige assessment form critical inputs into the CIC planning process. In addition to showing important trends, the assessment highlights the top areas for improvement. This year, communication, especially from the division office, came up as a key area for improvement. In response to this need, we have added a communication specialist to the division office who is charged with designing and executing a comprehensive CIC communications plan.

Table 1.2-1: Comparison of Overall Baldrige Self-Assessment Scores

Year	Total Points Scored
1997	260
1998	271
1999	320

As can be seen in this table, our overall scores have been steadily increasing. While we are still some distance from a "target" score of 500, we are moving in the right direction owing to a combination of good work processes and constantly improving management technique.

Table 1.2-2: CIC Totals by Baldrige Category for the 1999 Self-Assessment

Category	Points Available	Score
Leadership	110	37
Strategic Planning	80	26
Customer Focus	80	25
Info & Analysis	80	22
HR Focus	100	33
Process Management	100	28
Results Achieved	450	147

Table 1.2-2 shows that there is room for improvement in every category. It is important to note, however, that our leadership and results scores are among our strong points.

Table 1.2-3: Comparison of 3-year CIC Customer/Staff Scores

Year	Score
1997	194
1998	267
1999	330

This year customers and staff rated us at a much higher level than in previous years. The trend in their satisfaction is overwhelmingly positive.

Table 1.2-4: Comparison of 3-year CIC Division Leaders Scores

Year	Score
1997	314
1998	273
1999	311

The way in which CIC leaders view the division also improved markedly, as leadership roles are stabilizing into something near their final definition.

CIC Division's External Review Committee

The division's external review committee met in March 1999 to assess our ongoing activities. In the committee's estimation, our accomplishments over the past year "were exceptional, both in number and in quality." In particular, it commended our installation and quick transition to productive use of the ASCI Blue Mountain machine, our engineering leadership in developing high-speed interconnects and extending the Linux operating

system to high-end scientific computing, our success in integrating computer science research with scientific research, and our progress in ASCI code work.

The committee evaluated our work in four areas: (1) quality of science and engineering, (2) relevance of our work to national needs and agency missions, (3) performance in building and operating major research facilities, and (4) programmatic planning and performance. It gave CIC a rating of Outstanding in all four areas and noted that not only did we effectively pursue our specific goals in FY99, but we also built a strong foundation for future progress.

The committee's full report is included as an attachment to this IM self-assessment.

Performance Assessment

To achieve the rating of "outstanding," our customer service must reach a sustained high level of customer satisfaction. For FY99 we have clearly reached this rating level as indicated by the following evidence:

- Customer survey results, year after year, give consistently high ratings to CIC services.
- Use of services, such as IA Web pages, shows that CIC services are being used on an ever-increasing basis.
- The demand for desktop support services from CIC-2 has grown enormously, with MST and X Divisions this year contracting for full support services.

Criterion 1.3—Effective Internal Controls and Compliance

Provide for effective internal controls and ensure timely and effective resolution of identified weaknesses. (Weight = 20%)

Performance Measure 1.3—Internal Controls and Compliance Process Management

Degree to which an effective system for identifying, reviewing, and correcting (if identified) information management (IM) internal control and compliance processes is maintained. (Weight = 20%)

Assumptions

Measurement deliverable—describe and self-assess the techniques employed to ensure effective process controls, specifically addressing focus areas and any information management compliance issues appropriate to the Laboratory. The Laboratory and its DOE Operations Office will agree on focus areas.

"Compliance" refers to requirements of law, regulations and applicable DOE directives. To avoid duplication, the Laboratory will either self-assess or rely on recent internal or external audits, reviews, or assessments of relevant activities.

Gradients

Good—management techniques are employed to assess internal process controls, which include compliance and/or focus areas, and to correct identified deficiencies. Objective supporting material is available evidencing progress in identifying and correcting issues. Previous deficiencies have been corrected or have corrective action plans in place.

Excellent—there is a sound systematic approach responsive to the overall purpose of managing assessment processes and implementing corrective actions. Substantive progress has been made in self-identifying and closing deficiencies.

Outstanding—the Laboratory has institutionalized an evaluation process control for compliance issues and corrects weaknesses. This results in all compliance and agreement areas being corrected.

Performance Measure Results

In FY99, there were again no unresolved noncompliance issues in the IM area. Although some Year 2000 audits presented interim findings, these findings have either been resolved or are in the process of resolution.

There are several CIC activities that must demonstrate compliance with specific Appendix F performance measures. In this section, we report on these activities:

- Year 2000 Readiness
- Records Inventory
- Printing and Publishing Oversight

Year 2000 Readiness

Year 2000 Project

The Year 2000 Project, a subgroup within the Information Architecture (IA) Project, is coordinating the Laboratory's Year 2000 readiness and reporting efforts. We formed and lead the Year 2000 Council, made up of computer experts from all major divisions and programs, and we chartered and participate on the Year 2000 Facilities Planning team. We also coordinate a central database for tracking, auditing, and reporting Lab-wide Year 2000 readiness work, a Year 2000 Web site, and a project plan.

Reporting the Year 2000 status of Laboratory systems to DOE and ensuring that DOE milestones were met constituted major efforts for the Year 2000 Project staff. As shown below in the IM Performance Measure Data Sheet, the milestones were grouped into four categories spanning DOE mission-essential and safety-related systems and Laboratory critical and important systems.

Performance Measure Data Sheet

Functional Area:	**Information Management**
Performance Objective:	**1.3 Effective IM management systems, operational practices and internal controls**
Focus Area:	**Year 2000**

Performance Measure Description:

Ensure DOE mission-essential, non mission-essential and safety systems at LANL are Year 2000 ready in accordance with the DOE/CIO requirements.

Performance Expectation:

All mission-essential, safety, Laboratory critical and important systems Year 2000 ready by October 1, 1999. This measure will be estimated on September 17, 1999.

Category	Outstanding	Excellent	Good
DOE mission-essential (ME)	All DOE ME milestones are met by the DOE/CIO milestone dates or a DOE/AL approved exception is in place.	All DOE/CIO ME milestones are met by July 31, 1999 or a DOE/AL approved exception is in place.	All DOE ME milestones are met by the DOE/CIO milestones by Oct 1, 1999 or a DOE/AL approved exception is in place.
DOE safety-related systems	All DOE/AL negotiated milestones are met or a DOE/AL approved exception is in place.	85% of the safety-related systems meet the DOE/AL negotiated milestones or a DOE/AL approved exception is in place.	75% of the safety-related systems meet the DOE/AL negotiated milestones or a DOE/AL approved exception is in place.
Laboratory critical systems	100% of the Laboratory critical systems meet the LANL Year 2000 project plan dates.	90% of the Laboratory critical systems meet the LANL Year 2000 project plan dates.	80% of the Laboratory critical systems meet the LANL Year 2000 project plan dates.
Laboratory important systems	95% of the Laboratory important systems meet the LANL Year 2000 project plan dates.	85% of the Laboratory important systems meet the LANL Year 2000 project plan dates.	75% of the Laboratory important systems meet the LANL Year 2000 project plan dates.

Tables 1.3-1 and 1.3-2 record when mission-essential and safety-related systems met their milestones.

Table 1.3-1: Milestones and Completion Dates for Mission-Essential Systems

	Validate	Implement	Plan (draft)	Plan (final)	IV & V	End-to-end testing
Milestones	**1/31/99**	**3/31/99**	**4/30/99**	**8/30/99**	**4/30/99**	**6/30/99**
MASS	4/01/98	2/16/99	4/30/99	8/02/99	4/22/99	8/02/99
BRASS	10/21/98*	12/23/98	4/30/99	8/31/99	4/23/99	6/24/99
CLOCS	11/04/98	6/30/99**	4/30/99	6/24/99	4/22/99	4/22/99
Secure ICN	2/12/99†	3/31/99	4/30/99	8/20/99	4/30/99	6/23/99

*DOE HQ requested that as many systems as possible be escalated for completion, and BRASS responded.

**CLOCS completion was delayed because security accreditation by DOE/AL was delayed

†By January 31, 26 of the 28 components were validated; the last two components were validated on February 12.

Table 1.3-2: Milestones and Completion Dates for Safety-Related Systems

	Implement	Plan (final)	IV & V	End-to end testing
Milestones	**8/30/99**	**8/30/99**	**8/30/99**	**8/30/99**
1. CMR CAMS*	6/25/99	8/12/99	8/20/99	8/13/99
2. Hot cell facility CAMS	NA	8/05/99	8/17/99	8/03/99
3. LANSCE emissions monitoring system	NA	8/24/99	8/17/99	8/19/99
4. RAMROD CAMS	NA	8/05/99	8/17/99	8/03/99
5. RANT CAMS	NA	8/05/99	8/17/99	8/03/99
6. Rad liquid waste CAMS	8/09/99	8/30/99	8/27/99	8/20/99
7. RLW-manhole leak detection	NA	8/20/99	8/27/99	8/20/99
8. RLW liquid waste ventilation	NA	8/30/99	8/27/99	8/18/99
9. TA-54 CAMS	NA	8/30/99	8/27/99	8/30/99
10. TA-54 drum vent system	6/01/99	12/01/98	8/27/99	8/27/99
11. TA-55 facility control system	8/9/99	8/6/99	8/26/99	8/26/99
12. TSFF-UPS	NA	8/20/99	8/27/99	8/27/99
13. TSTA-master data acquisition and control	8/05/99	8/20/99	8/27/99	8/27/99
14. WCRR CAMS	NA	8/05/99	8/17/99	8/03/99
15. WCRR digital data controller	6/28/99	8/13/99	8/17/99	8/09/99
16. WETF breathing air	NA	8/20/99	8/27/99	8/27/99
17. WETF HVAC	NA	8/20/99	8/27/99	8/27/99
18. WETF instrumentation and control	8/11/99	8/20/99	8/27/99	8/27/99

*CAMS (continuous air monitoring system)

For mission-essential systems, we accomplished all milestones that were due on or before July 31 and also met the August milestone for final contingency planning, earning an “excellent” rating for our work.

The data on safety-related systems require some explanation. To begin with, a safety-related system is one that is referenced in an authorization basis document. On April 7, 1999, DOE HQ issued guidance calling for identification of all safety-related systems at the Laboratory. The Laboratory had a false start in this process because we began by identifying only 7 nuclear facilities that required study. However, during the June 3 DOE HQ site visit, DOE LAAO pointed out that we had 19 nuclear facilities. Subsequently, three high- to moderate-hazard facilities were also identified, bringing the total to 22 facilities for study. As a result of these developments, we negotiated a new due date (August 30) for all safety-related milestones.

Once we understood the facilities of concern, we identified their systems that used dates for processing or data collection. Of the 160 systems examined, 18 had digital components with date sensitivity; of these, 7 systems required Year 2000 repairs and 11 did not (see Table 1.3-2). The DOE/AL IV&V safety system assessment stated that “Los Alamos National Laboratory has adequately identified safety system that require Y2K attention.” The August DOE HQ review applauded our approach to defining safety-related systems and our use of independent experts in validating those systems. All the safety-related system milestones were met by August 30, earning us an “outstanding” rating.

For Laboratory systems, we used the risk criteria shown in Table 1.3-3 to determine which systems were critical and important and should therefore receive the most attention. Tables 1.3-4 and 1.3-5 show the current status of Year 2000 readiness for all critical and important systems.

Table 1.3-3: Risk Assessment Criteria for Laboratory Systems

	Critical	Important	Noncritical
The Mission	Unable to perform or major disruption/delay	Minor disruption or delay	No disruption or delay
Health and safety	Death or major illness or injury	Minor illness or injury	No illness or injury
Security	Major security concern	Minor security concern	No security concern
Environment	Irreversible or major environmental damage	Minor environmental impact	No environmental impact

Table 1.3-4: Status of Laboratory Critical Systems as of September 17, 1999

Number of systems	1,311
Quantity assessed	1,311
Quantity completed	1,309
Percentage complete	99.8%

Table 1.3-5: Status of Laboratory Important System as of September 17, 1999

Number of systems	2,043
Quantity assessed	2,041
Quantity completed	1,964
Percentage complete	96%

We achieved an “outstanding” rating on critical systems, which required that all such systems meet the Laboratory’s Year 2000 project milestones by September 30. Although two systems were not completed by September 17, we fully expect them to be complete by September 30. We also achieved an “outstanding” rating on important systems, which required that 95% of these systems meet Year 2000 milestones by September 30.

In addition to these compliance activities, we worked with the Civilian and Industrial Technologies Program Office (CIT-PO) to develop a Year 2000 Readiness Disclosures survey and Web site for software that has been developed at the Laboratory and distributed externally. The Web site gives the status of the software’s Year 2000 readiness.

Our IA Year 2000 Web site (http://www.lanl.gov/projects/ia/year2000/) has also been useful tool for Year 2000 readiness work. It provides information on product readiness, testing, embedded systems, and FAQs for specific Laboratory systems as well as tips of the week on specific remediation issues and links to other useful sites. More than a dozen other Year 2000 sites are linked to our Web site, including the DOE CIO Year 2000 site. DOE has recognized our Web site as providing “an excellent source of information on PC/Windows, Macintosh, Unix, Networks, and Embedded System products.” Our site was also recognized by the American Waterworks Association as one of the “Best Year 2000 Sites” (http://www.awwa.org/y2k05.htm).

Finally, we have used a variety of means, including presentations, posters, and brochures, to communicate information on both personal preparedness and Lab-wide readiness issues. Diane Weir, the Year 2000 Project leader, has given presentations to community groups in northern New Mexico and at a variety of Laboratory forums, such as All Managers Meetings and other management groups.

CIC-13 Code Modifications

During FY99, CIC-13 completed 95% of the Year 2000 code modifications and testing for business information systems (see Figure 1.3-1). This achievement entailed 25,000 hours of work by 60 programmers on 160 applications and computer software programs. The project was managed efficiently and effectively using the following tools and process:

- All applications were identified and tracked in Microsoft Project and Excel.
- Five separate testbeds—for IBM, VAX, Windows NT, Unix AIX, and Solaris platforms—were created to test all software.
- One common test plan was defined and followed on all software.
- A single contingency plan for solving any problems that develop after January 1 was written to cover all software.
- Progress on the project was tracked on a weekly basis and reported on a monthly basis.
- Project information was published on the Web for easy access by auditors, project team members, customers, and the Laboratory as a whole. Documentation covered the project plan, milestones, contingency plan, test plans, and testing schedules.

Our overall Year 2000 project came in on budget and within schedule.

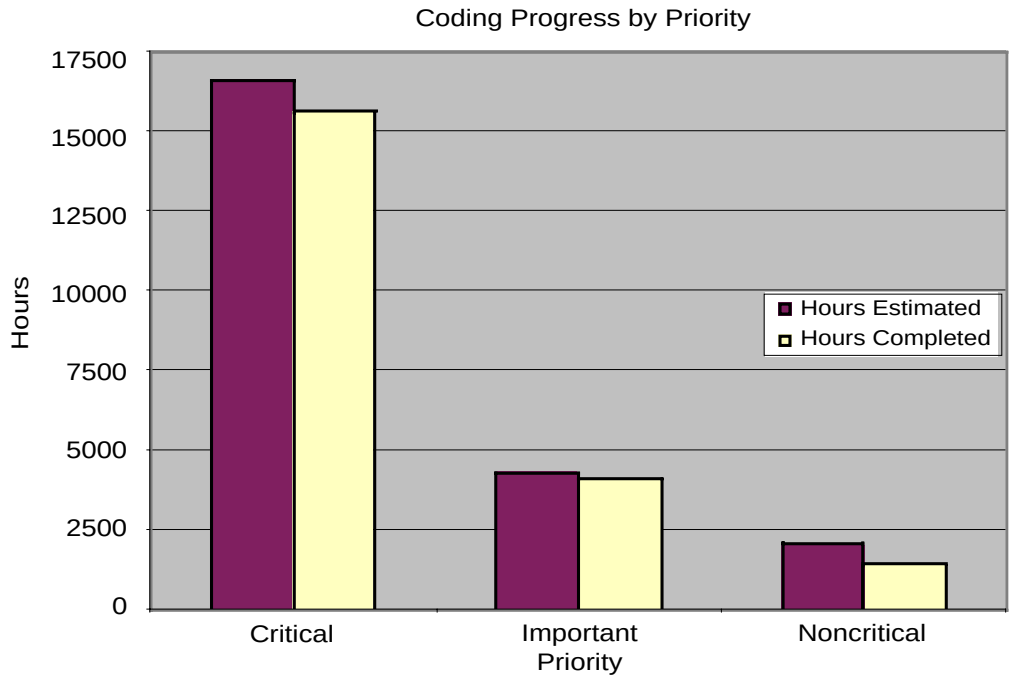


Figure 1.3-1. Code modifications for business information systems within each of the three priorities are nearing completion.

Records Inventory

CIC-10 has the long-range goal of developing an integrated records/information management program for the entire Laboratory. The first phase in reaching this goal is to complete a Laboratory-wide records inventory. The second phase is to coordinate records management operations within individual Laboratory organizations, and the third, to implement a cohesive Lab-wide records management system.

We continued this year with our Laboratory-wide records inventory, completing the second full year of operations under Appendix F. Our objective is to analyze all Laboratory organizations and their record holdings and identify record series (groups of common records). Such series are the foundation for managing records from cradle to grave because they offer the mechanism for developing retention schedules—formal documents that provide guidance on how long to keep records. Retention schedules ensure that records of low value are not kept longer than necessary and records of high value are preserved. By properly managing records, the Laboratory can avoid the costs of both unnecessary storage and of recreating information that was prematurely destroyed.

By the end of June, we had completed 58% of the inventory, a figure that meets the performance criterion for an "exceeds" rating for the fiscal year (see below). By the end of the fiscal year, we completed 61% of the inventory for a "far exceeds" rating.

Records Inventory Performance Metric for FY99:

Needs Improvement	Meets	Exceeds	Far Exceeds
<48%	48% to 52%	53% to 58%	>58%

Because of our progress on the inventory, we have begun work on the second phase of our records management plan—coordinating records management activities within individual Laboratory organizations. Each organization has unique records management requirements. Some have heavy compliance needs, while others require guidance or advice on general record-keeping requirements. Throughout FY99, inventory staff have been

assisting Laboratory organizations with such activities. By the end of June, over 95 requests for help had been received and answered.

Other accomplishments of the inventory team include the development of a Web site where customers can access records management information, development of a listserve that allows staff to make general announcements of records management information to a wide audience (over 100 subscribers), and formalization of a records destruction process.

Special Tasks

Throughout FY99, CIC-10 has been called on to perform a number of special tasks that have contributed to the overall operations of the Laboratory. We continue to provide records research for the Lab's legal office. This research ranges from litigation involving personnel matters to espionage. We have also assisted the FBI as it investigates allegations of espionage at LANL. We have assisted in two health-related studies: a project by the Centers for Disease Control that is looking at exposures involved in any off-site releases of radiation, and a NIOSH study looking at occupational health. As the primary record holder for the Laboratory, CIC-10 oversees information that is critical to the success of these projects.

CIC-10 is also responsible for administering the Lab's information practices program, including the Freedom of Information Practice Act, the California Information Practices Act, and the California Public Records Act. Figure 1.3-2 shows the number of requests for information that we have received each calendar year. On average, each request requires 48 hours of staff time to answer.

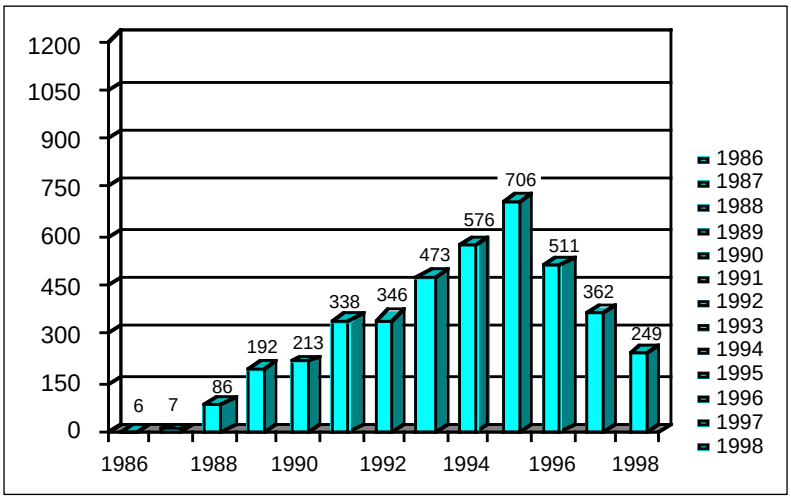


Figure 1.3-2. Number of requests CIC-10 has received in administering the Laboratory's information practices program.

Our Central Weapons/Production Information Center (CWIC) team has been working on a project to identify and properly store over 1000 cubic feet of radioactively contaminated records. These records have come to us from Rocky Flats and Mound Laboratories in support of stockpile stewardship. For this work, the team has been trained in handling radioactive material and on procedures that guarantee the integrity of the information as the records are converted to new, uncontaminated formats.

Finally, this year CIC-10 managers addressed a long-standing need to reclassify operational staff in the group. The staff had been performing in new and expanded roles for a long time without having these new roles and responsibilities formally recognized. During the fiscal year, the Human Resources Division audited all nonmanagement jobs in the group and upgraded them as appropriate. The Director's Office supported this activity and provided the necessary funds to finance staff reclassifications. All of our reclassification requests were approved, and many were significant in that they moved staff from clerical to professional levels.

Printing and Publishing Oversight

As the Laboratory's Printing Officer, the group leader of CIC-9 is responsible for ensuring that all printing and publishing activities at the Lab comply with Title 44 of the United States Code, with Joint Committee on Printing regulations, and with DOE Order 1340.1B. During the review process for last year's Appendix F report, concerns were raised about whether all printing, duplicating, and copying activities at the Lab were in full compliance with these regulations. As a result, leaders of CIC and BUS Divisions met this year to clarify compliance requirements and to establish process controls that would ensure full compliance.

Separate guidelines were established for purchasing printing and duplicating services and equipment with (1) purchase cards, (2) hard-copy purchase requests, and (3) TIPS, the Lab's online purchase request system. The Lab's Printing Officer must approve all purchases of printing and duplicating services and all purchases of copiers and high-capacity network printers. Procedures to ensure this oversight on purchase card and hard-copy purchase request transactions were developed and then communicated Lab-wide through several master management memoranda. Similar guidelines for oversight of purchases with TIPS were developed and will be implemented during the first quarter of FY 2000. BUS is now referring customers to CIC-9 when BUS receives purchase requests that have not been approved by the Printing Officer.

CIC-9 manages the life cycle of equipment purchased through the Three-Year Plan for the group's in-house print plant, maintaining plant inventory, documenting transfers, and advising the Joint Committee on Printing of any surplus equipment. BUS manages the life cycle of all equipment, such as convenience copiers, purchased by other Lab organizations.

Additional information about the requirements for obtaining printing, duplicating, and copying services is being added to the Lab's online publications manual, *Publishing at Los Alamos*, in the section on Publishing Resources. A draft of this section is currently in the final review stage.

CIC-9 also oversees a number of other printing and publishing activities at the Laboratory. Our work in carrying out these responsibilities is summarized below:

- **Copyright oversight**—We continued to work closely with CIC-1 and the Laboratory Counsel Office to ensure that copyright laws and policies are followed. *Publishing at Los Alamos* (http://int.lanl.gov/publishing/) contains specific guidance on copyrights and on how one obtains written permission to use copyrighted material in Lab publications.
- **GPO and UNICOR oversight**—CIC-9 obtains approximately 80% of the printed materials used by the Laboratory through the Government Printing Office (GPO). We have 12 term contracts in place for various printing products, and we modify these contracts as needed to keep pace with changing customer requirements and to provide services that have been discontinued at our own in-house print plant. We often combine in-house and GPO services to meet customer needs, such as when we have report covers printed through a GPO contract (we no longer maintain an in-house offset printing capability) and then add them to text that is reproduced in-house. In FY98, the Lab spent $560,000 with GPO vendors. We did not use the Federal Prison Industries, Inc. (UNICOR) for printing work.
- **Ensuring the validity of our data for the Three-Year Plan and Semiannual Commercial Report**—One source of data for these reports is the Lab's financial systems, whose validity can be confirmed by audits. For example, the Three-Year Plan requires an accurate count of printing impressions produced both in-house and through GPO. The counts we give in the plan are the same counts that are used to generate the vouchers that recover the costs of producing those impressions from the customer. We draw our data on the number and types of publications produced at the Lab from the Classification Group, S-7, which is responsible for maintaining such statistics as part of its mandatory review and release process. Journal publication data again come from BUS records.
- **Copy Center oversight**—CIC-9 operates the Lab's one authorized printing and duplicating facility. Our management of the center, including equipment purchases, is subject to review by the DOE Area Office and the Joint Committee on Printing. As the Lab's Printing Officer, the CIC-9 group leader reviews and must approve purchases of convenience copiers located elsewhere at the Lab. The review process ensures that purchases will result in neither excess nor understaffed duplicating capacity that would conflict with printing policy guidance.

- **Customer awareness training on printing policies**—CIC-9 maintains a Web site that defines group capabilities and who to contact for more information on those capabilities. This past year, we also used master management memoranda, as mentioned earlier, to educate Lab managers on the policies and procedures that govern printing/copying services and equipment. The Printing Officer, BUS staff, and Lab customers meet as needed to discuss problems and issues related to these policies.
- **Print plant staffing and training**—In FY99, we needed 7.3 FTEs to manage and operate our in-house printing and duplicating facility and to fulfill our GPO liaison responsibilities. As we add new equipment and respond to changing customer service needs, our staff receive on-site cross-training to increase their versatility. They also stay current with required Lab-wide training, such as the Annual Security Refresher and safety certifications.
- **Customer surveys**—In FY99, we undertook a comprehensive survey to determine customer satisfaction with our products and services. Results are provided under Criterion 1.2.
- **Publications and color printing oversight**—The CIC-1 group leader is responsible for approving color printing in Laboratory documents. CIC-1 staff work closely with the Classification Group, S-7, in overseeing the Lab's publication process. The Lab's online publications manual, *Publishing at Los Alamos*, defines that process and the procedure for obtaining color printing approval.
- **Business card oversight**—By regulation, Laboratory employees have not been allowed to purchase business cards with Lab funds. However, in light of recent exceptions that have been made to this regulation, the Printing Officer is working with BUS Division to develop and implement Lab-wide procedures for business cards. We expect to implement these procedures during the first quarter of FY 2000.

Performance Assessment

To achieve the rating of "outstanding," we must show that we have effective process controls for compliance issues that correct weaknesses. We must also show that compliance and agreement issues have been satisfied. We clearly meet these criteria based on the following evidence:

- We had no unresolved noncompliance issues in FY99.
- Our Year 2000 activities are vigorous and effective and have met many of the DOE guidance milestones. More importantly, our Year 2000 program has positioned us for success at the turn of the millennium.
- By year end, the Records Inventory Project will have surpassed its milestone for the "outstanding" rating.
- Great strides have been made in printing and publishing, including assertion of control over ad-hoc printing efforts that at times can cause compliance-related problems to arise.

In summary, we rate our performance as "outstanding" based on the strong evidence presented above.

Criterion 1.4—Strategic and Tactical Planning

IM plans and practices are aligned with Laboratory strategic and tactical requirements. (Weight = 20%)

Performance Measure 1.4—Planning Initiatives

Evaluation of evidence that IM is aligned with the Laboratory's mission. (Weight = 20%)

Assumptions

Measurement deliverable—IM plans or descriptions of IM initiatives that support the mission and plans of the Laboratory. Reference may be made to accessible work products or other existing Laboratory documentation.

Gradients

Good—planning, evidenced by documentation, that effectively supports the Laboratory's missions.

Excellent—a planning process exists that drives IM practices to align with the Laboratory's missions.

Outstanding—evidence that the IM planning process can adapt to changing conditions, uses sophisticated methods or planning tools, and has received external recognition of excellence.

Performance Measure Results

FY99 was an unusual year for the Laboratory, and in the IM arena it was dominated by information security and Year 2000 activities. This diffused the focus of information management and affected the validity of our annual plans. Nevertheless, some substantial progress was made and important milestones were achieved.

In the spirit of identifying areas for improvement, however, we recognize that our attention to CIC's Integrated Management Process (IMP) was less than it has been in previous years and that our strategic focus yielded in the face of extreme tactical pressures. Much of this was unavoidable, yet certainly improvements should be made and indeed are underway. Still, we also wish to emphasize that a year filled with the accomplishments described earlier in this report would never have been possible without a good degree of effective planning.

In our description of performance results for CIC planning initiatives, we focus on the following:

- Strategic Planning Sessions
- Business Planning Process
- IM Focus Team Activity
- CIO Council
- Group-Level Strategic Planning

Strategic Planning Sessions

CIC Division managers held a one-day strategic planning retreat in January with the following order of business:

1. Draft a high-level mission statement.
2. Analyze the strengths and weakness in each of the division's three organizational areas (strategic computing, research, and information services).

The session resulted in the following draft mission statement:

The mission of the Computing, Information, and Communications Division is to provide advanced computation resources and information technology to our clients. Part of this mission is accomplished through our continued research and collaborations with industrial partners to develop the fastest and most powerful computers that can be applied to mission-related problems here at the Laboratory and to problems of national and international

significance. We have historically taken a leadership role in developing state-of-the-art computing technology (including data transfer, storage, and display), and our mission is to continue that important role. In addition to our important collaborations with vendors, we partner with our customers to help them achieve their goals. We have an innovative and creative staff who are constantly updating their skills and knowledge and who continually offer innovative and creative solutions to problems. Our mission includes providing those people a rewarding environment in which to work on challenging problems in all areas of computing, information, and communications.

We expect to revise and finalize this mission statement over a period of time.

In July, all CIC managers participated in a two-day retreat in Taos. The purpose of the retreat was to examine critical problems facing the division and to produce follow-on plans and action items that addressed those problems.

The following important action items resulted:

- Nick Nagy will revitalize strategic and tactical planning within CIC by updating the previous, highly successful Integrated Management Process (IMP).
- John Reynders will reexamine the research leadership role within CIC.
- Gary Clark will provide recommendations on how the division can meet operational objectives in a resource-constrained working environment.
- Charlie Slocomb will develop a strategy on the short- and long-term efforts of the Information Security (InfoSec) Office.
- John Morrison will examine and elucidate the CIC decision-making processes.
- Hans Ruppel will examine synergies across the areas of CIC: strategic computing, information services, and research.
- Bob Newell will study the direction of information services, with a goal of establishing the concept of information stewardship.

The execution of these strategic initiatives will position CIC even better to serve the mission of the Laboratory while increasing the division's internal strength and efficiency.

Business Planning Process

The process for aligning CIC goals with Laboratory goals at every level within the division is as follows:

- The Laboratory Senior Executive Team (SET) drafts high-level goals for the Laboratory. Starting with John Browne and the rest of senior management, early in the year a series of goals is developed and refined.
- The Laboratory goals are passed to Steve Younger in the Nuclear Weapons Directorate. These goals are translated into directorate goals, which are passed on to CIC.
- In CIC, the Laboratory and directorate goals form part of Division Director Charlie Slocomb's accountabilities. These goals are then translated into CIC goals and passed to the CIC group leaders.
- CIC group leaders further refine the division's goals as appropriate.
- At performance appraisal time, individual employee goals are established for the coming year that align with the above cascading goals.

There is thus an unbroken chain from top-level Laboratory goals right through to the goals of individual CIC staff members.

In addition, the cascading goals form part of the basis for CIC group leaders to develop annual group business plans, which are submitted to the division office. Information Services group leaders meet several times a month with the Information Services Deputy Division Director to informally review progress those business plans.

Nevertheless, we must identify a weakness in this year's process. The IMP, which was previously used to manage and integrate business planning across the division, was not effectively followed in FY99. CIC recognizes this weakness, and, as described elsewhere in this document, we are renewing our efforts to bring integrated planning back on track. In September 1999, Nick Nagy will be leading a team whose purpose is to reinvigorate business planning by developing and launching an updated follow-on process to the IMP.

We expect that as a result of this self-assessment and follow-on action, in FY 2000 we will be back on track and better than ever in our business planning efforts.

IM Focus Team Activity

In July, the IM Focus Team was realigned and given a new mission, based partially on the results of the division's Taos retreat. The team now comprises the eight Information Services group and project leaders and the associated deputy division director. The team's charter is to identify and work on strategic issues that affect information management within CIC Division.

At the team's initial meeting, the CIC Applications Summit, a full day was spent defining enterprise applications and identifying related work targets. Two tasks were launched:

1. Upgrading the Lab's internal Web site to make it a true portal for the information resources at Los Alamos (initial results due October 1).
2. Combining the myriad recharge-tracking systems into a single integrated system (results due in November).

The reconstituted IM Focus Team meets every two weeks with defined agendas and expected outcomes. Despite its short history, the team has already begun to provide an important strategic focus for information services within CIC.

CIO Council

An entirely new initiative for the Laboratory is the Chief Information Officers (CIO) Council, which was formed by CIC Division this July and first met in late August. The CIO Council is to the Laboratory what the IM Focus Team is to CIC Division. The council is composed of members from CIC, HR, ESH, BUS, F, and ESA Divisions and from the Quality Improvement Office; additional members from TSA and PM Divisions are being recruited.

The council's initial focus is on enterprise systems, and its first meeting was an all-day session called the Laboratory Applications Summit. The Council is intended to be a forum at which policy issues relating to information management can be discussed and recommendations prepared for consideration by senior Laboratory management.

The formation of the CIO Council represents a breakthrough in the effort to lend rationality to the diverse information service activities that take place throughout the Laboratory. For the first time, the major players and stakeholders are gathering in a cooperative forum to propose policy and action steps on a joint basis. Creating the CIO Council is a major strategic advance by CIC Division on behalf of the entire Laboratory.

Group-Level Strategic Planning

During 1999, several groups within the IM area of CIC provided exemplary results in the strategic and tactical planning arena. Two such efforts are featured here: the Communication Arts and Services Group undertook a long-range strategic planning exercise, and the Research Library continued to refine its model planning process.

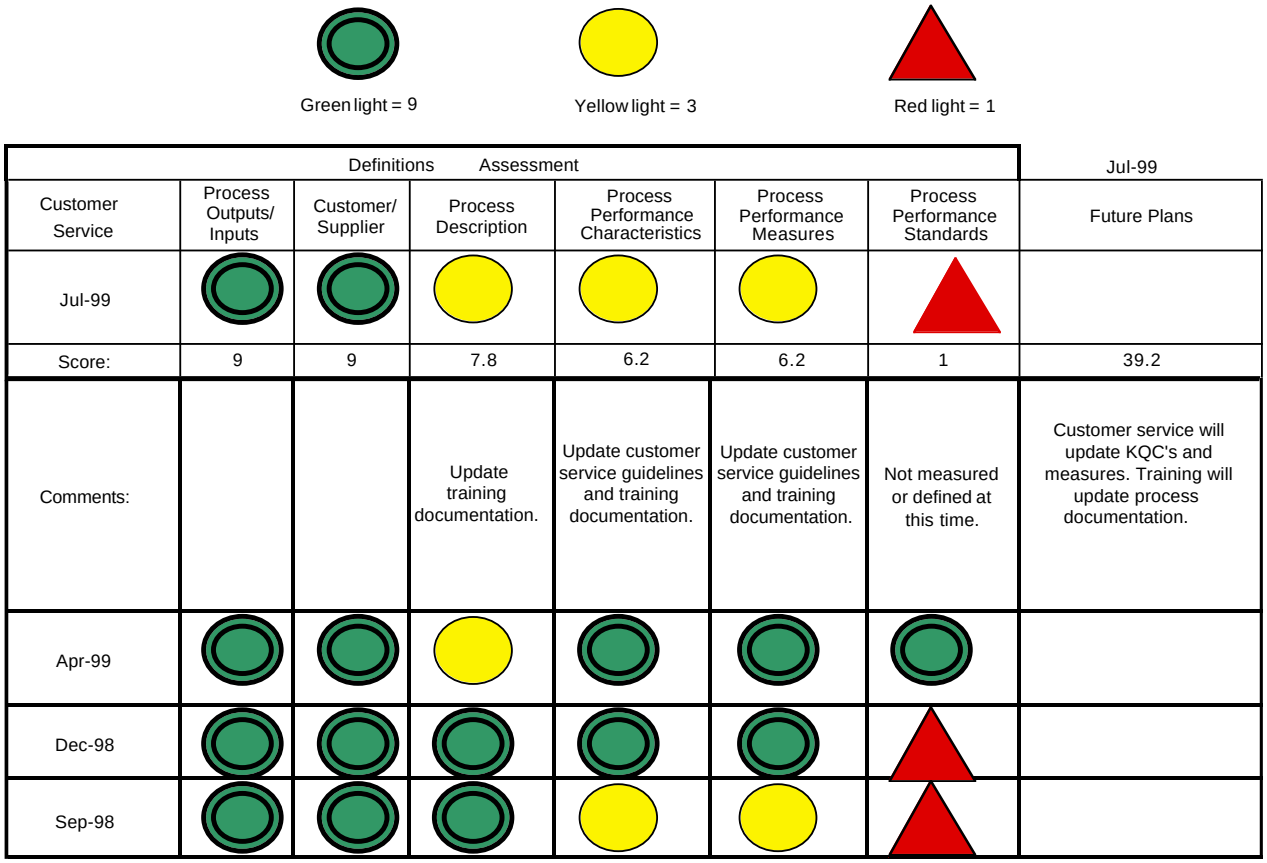
Communication Arts and Services

CIC-1 managers and staff are completing a strategic planning exercise to forecast the products, services, and capabilities customers will require in the next 3 to 5 years and beyond. The plan is aligned with Laboratory and CIC Division missions. Still in draft form, our plan will be finalized by the end of the fiscal year and will be used to measure group performance in FY 2000. Together with our benchmarking exercise described in Criterion 1.1, the plan will drive decisions about CIC-1's organizational structure, staffing levels, training and professional development, and process improvement.

Research Library

As a DOE and Laboratory support organization, the Research Library must thoroughly justify yearly budget requests with productivity and customer satisfaction data, as well as with documented efforts in saving money for the Laboratory. Increasing productivity while decreasing costs is a prime focus for the Library in our efforts to provide the scientific literature needed by our customers.

Thus, quarterly and annual performance assessments in our strategic business management system help Research Library staff focus on operational and strategic performance levels. Each of our products is assessed based on customer survey data received each quarter. Assessments are conducted in six categories: Definitions, Quality, Strategic, Desired Business Results, Customer Satisfaction, and the Business Plan. Each category is further divided into several areas, and a scoring system is used to determine whether the process is improving, getting worse, or remaining the same. Figure 1.4-1 gives a pictorial representation of the assessment. A “green light” represents a process in control, a “yellow light” represents a process moving in the right direction toward improvement, and a “red light” means that a process is in trouble or there are no measurements or documentation for it.



	Definitions	Assessment					Jul-99
Customer Service	Process Outputs/ Inputs	Customer/ Supplier	Process Description	Process Performance Characteristics	Process Performance Measures	Process Performance Standards	Future Plans
Jul-99							
Score:	9	9	7.8	6.2	6.2	1	39.2
Comments:			Update training documentation.	Update customer service guidelines and training documentation.	Update customer service guidelines and training documentation.	Not measured or defined at this time.	Customer service will update KQC's and measures. Training will update process documentation.
Apr-99							
Dec-98							
Sep-98							

Figure 1.4-1. Pictorial representation of the Research Library’s performance assessment.

Customer Satisfaction Assessment. This assessment is used to determine how well a process should be operating by assessing its performance behavior from the viewpoint of customer satisfaction with the quality of the product and service received. The intended result is the identification of performance issues that are the most important, yet least satisfying, to our customers. Key measures are assessed in the areas of product/service availability, product/service quality, product/service delivery, requesting products/services, customer assistance quality, and facility/resources quality. Our leading indicator of success is an increase in market share over time. Another indicator is the number of signed DOE User Facility agreements with external customers for access to our electronic databases in conjunction with the increase in external funds generated.

Definitions Assessment. This assessment is used to determine whether the process documentation describes the current level of knowledge of the process. Some specific aspects of the definitions assessment include

ensuring that each process has documented customer key quality characteristics (KQCs), flowcharts, and process KQCs. This knowledge provides a basis for planning and measurements.

Quality Assessment. This assessment determines how well a process is operating by assessing its performance behavior in terms of output effectiveness and process efficiency. The intended result is the identification of opportunities for improving the effectiveness of process measures and for achieving process stability. Key measures are addressed in process output quality, process responsiveness, process productivity, process costs, and process input quality. The desired level of a process is an acceptable level relative to defined key performance characteristics, or the performance behavior of other processes. Process costs are tracked on a monthly basis for each output process to determine a trend. The goal is to increase process productivity while decreasing costs within that process.

Strategic Assessment. This assessment focuses on next-year projections.

Desired Business Results Assessment. Financial and market-related performance is measured in this results assessment. The assessment measures how well the Library is doing as an organization in conducting its processes relative to the five identified desired business results (DBRs). Overall, the key measures obtained for each DBR enable us to see how well the Library is performing its established mission.

Review of Library Performance. The quarterly and annual performance assessments are systematic analyses of our performance. Development, tracking, and action constitute the deployment step of our Business Plan. Once a performance assessment has been completed, data and comments are solicited from a feedback session. Process owners will then discuss the issues generated and added to the Business Plan with their teams. Assessment data is analyzed relative to the Business Plan. The July 1999 quarterly assessment focused on (1) understanding, documenting, and measuring *change*; (2) understanding what is changing, why it's changing, and what we are going to do about it; and (3) re-evaluating the Business Plan based on current data.

Performance Assessment

To achieve the rating of "outstanding," we must show that the IM planning process can adapt to changing conditions, uses sophisticated methods, and has received external recognition. While we can show some of these achievements, we cannot in all honesty claim to reach a rating of "outstanding" this year. Addressing tactical issues such as information security and Y2K compliance necessarily diverted some of our attention from strategic planning.

To achieve an "excellent" rating, we must show that a planning process exists that drives IM practices to align with the Laboratory's mission. By showing how goals cascade from the very highest level of Laboratory management all the way to CIC staff members, we have documented that our planning process clearly does meet this criterion.

We have also met the intent of the criterion by identifying weaknesses in our planning processes and presenting a credible action plan for their remediation. In addition, we have launched significant new and innovative strategic initiatives that contribute to the mission and effective management of the Laboratory.

In summary, we rate our performance in this area for FY99 at the "excellent" level, with several initiatives rising above the requirements of this level.

Appendix F Report Attachment

CIC-Division Review

March 24-26, 1999

Cherri Pancake, Chair
Dave Cooper
Stuart Feldman
Michael Harrison
Gian Carlo Rota (dec.)
Paul Woodward

In Memoriam
We were much saddened by the sudden death of an esteemed member of the review panel, Professor Gian Carolo Rota. He was a brilliant mathematician, a long-term friend, and a valued contributor to Los Alamos. We respectfully dedicate this report to his memory.

1. Executive Summary

A Division Review Committee was convened in March 1999 to review ongoing activities in the Computing, Information, and Communications (CIC) Division. Based on the evidence examined during this review, the Committee found that the Division's accomplishments over the past year were exceptional, both in number and in quality. Among the most significant were:

- The installation of the 6,144-processor ASCI Blue Mountain machine and its almost immediate attainment of 1.6 TFLOPS.
- A remarkably quick transition of the machine to a production-level environment that resulted in significant progress on several key ASCI codes.
- Achievement of leadership roles in two important engineering areas: the integration of highspeed, very large-scale interconnects; and development of cost-effective Linux-based support for large-scale computing.
- The close integration of computer science research and practical computational science, leading to significant achievements in several areas of advanced technology research.
- The development of practical software engineering techniques that were able to be penetrated into ASCI code team processes.
- Rigorous study of the low-level behavior of ASCI codes, leading to critical discoveries about the sources of performance degradation and their implications for future generations of HPC machines.

2. The Review Process

The Division Review Committee (DRC) met at Los Alamos on March 24-26, 1999. We reviewed the progress of CIC over the past year and compared its situation with the experiences at "peer institutions." These were defined to include: the other ASCI sites, other DP and ER centers (e.g., ORNL, ANL, LBL), the NASA research center, the DOD Major Shared Resource Centers, two DOD Distributed Centers (MPHCC, ARSC), and four academic HPC centers (NCSA, SDSC, NCAR, PSC)

The meetings began with a presentation from Lab management on the general status of the Lab and CIC's relationship to the other Divisions and the charge to the DRC. Overview presentations by Slocomb and Morrison provided the context for the DRC's work and outlined several areas where feedback was particularly needed. The next day and a half were structured into 2-hour sessions on specific themes: strategic computing platform, visualization, problem-solving environment, software engineering, research in algorithms, and research in architectures. Each session began with presentations, but at least half of the allotted time was devoted to Q&A

and open discussion. The final day was reserved for committee deliberations and the formulation of recommendations.

This new format was a direct response to DRC requests at the previous meeting, when almost all time had been allocated to presentations. We commend CIC on the improvements, which gave us the opportunity to questions group leaders and presenters on particular details of their work. The looser structuring of the third day allowed us to meet with individuals and pursue ideas for recommendations in greater depth than had been possible in the past. It also made it possible for the DRC to present its findings not just to the Lab Director and upper management of CIC, but in a separate meeting involving all group leaders, who indicated that they appreciated the opportunity to hear the information first-hand.

The remainder of this report describes our findings in each of the four areas for evaluation:

- Quality of Science and Engineering
- Relevance to National Needs and Agency Missions
- Performance in the Construction and Operation of Major Research Facilities
- Programmatic Performance and Planning

Each section includes examples of the accomplishments that motivated our assessment. The report concludes with a discussion of the areas that represent key challenges to CIC - and indeed, to the Lab as a whole - and a series of specific recommendations to help ensure that the level of success remains high in coming years.

3. Quality of Science and Engineering

Assessment: **Outstanding**

Discussion: The committee reviewed a number of research efforts underway in CIC. These can be viewed as falling along a spectrum that reflects the immediacy of the projects' relevance to the Lab. Some projects are initiated in direct response to an urgent need that cannot be filled through software, algorithms, or expertise available in the broader community. Others bring computer science research from the outside community to bear on problems of direct and immediate importance to the Lab. Still others look far forward in areas that will be of critical concern to the Lab. In this section, we present examples of each, as evidence of the exceptional work that is being carried out within the Division.

The committee found that the principal strength of CIC research derives from its direct connections with practical applications at the Lab. This situation is unusual; most of the peer institutions are focused either on scientific research or on computer science research. It is rare, however, to find such close integration of the two communities. This situation clearly improves the caliber of work, providing practical focus for the computer science teams yet still allowing them to pursue some of the open research questions that are likely to yield significant benefits for the science teams.

Network Engineering. The Blue Mountain machine presented a unique problem in terms of how to develop and manage an interconnection network for a "one-off" system including 6144 processors. Due to changing priorities, the hardware vendor could not be expected to provide a solution that would be acceptable to the ASCI program in terms of overall performance or efficiency. The situation was exacerbated by the fact that no third-party contractor could demonstrate the necessary expertise. CIC took on the challenge of engineering an interconnect that would meet the unique ASCI needs.

Their success was outstanding. This was an exceptional engineering feat that required design not only of the interconnect architecture, but construction of the physical structure and implementation or redesign of many layers of software protocols. The team accomplished this within a remarkably short period of time. Moreover, they managed to implement a design whose features offer many possibilities for exploiting both performance and fault-tolerance.

The "Resilient Communication Architecture" exploits the type of layered approach that has been used effectively for operating systems. Each layer isolates particular functionality and communicates with the layers above/below it through a formally defined interface. While most software operates at one layer, calling the one beneath it to provide lower-level functions, it is also possible to access the lower layers directly in order to improve performance. (Networking systems, on the other hand, typically enforce the layers more rigidly, making it difficult or impossible to "bypass" layers in the interest of speed.) This approach offers several key advantages:

- Application developer anxious to get the best possible performance can interface to the lower levels (which requires more implementation time but yields better speed).

- Alternatives for accessing the interconnect provide "fallback" positions that will make it possible to run ASCI codes even when higher layers (e.g., MPI) break under the unusual scaling requirements associated with these large codes.

- The ability to bypass software layers makes it possible to use the functioning system as a foundation for evolving new software protocol layers - e.g., to implement and test new routing schemes, new mechanisms for reliability and fault-tolerance, etc.

- It provides a foundation for future hardware evolution as well. The new GSN project will implement TCP-related features in hardware; it will be possible to incorporate the faster hardware without having to rewrite software layers.

CIC has achieved a leadership role in the area of large-scale, high-performance interconnects. This project is serving as a prototype implementation of a new ANSI standard, and the Division also leads the ANSI committee associated with the GSN standard. (The DRC encouraged continued participation in the latter effort, at that time referred to as HiPPI 6400, as part of a previous report.) Finally, since some of the layers directly involve the operating system, this project would not have been possible without the special efforts of the Division (described later in this report) to establish strong collaborations with SGI.

Extreme Linux. Los Alamos has taken a lead on extending the Linux operating system to high-end scientific computing. CIC has sponsored conferences, built alliances, and initiated discussions with the originator of Linux about incorporating changes necessitated by large numbers of processors working on numeric problems. We applaud this work for two reasons:

- Linux clusters are a promising, cost-effective way to do large scale computing. It is directly relevant to the national goals of LANL. Even if it does not soon apply to TeraFLOPS-level clusters, software can be tested and tried on smaller problems much more effectively. By developing first on Linux as a portability base, it will be much easier to move codes between hardware architectures and computing environments within DOE.

- By building middleware and applications on a Linux base, it will be much easier to exchange software with groups outside of LANL, especially in universities. Work that LANL does will have a far greater impact if many hundreds of groups can use it immediately. Furthermore, improvements and new ideas from those areas will be rapidly importable into the LANL environment.

CIC has made a significant start on making Linux suitable for the Lab in general and ASCI-related applications in particular. The Division is currently developing studies to test the reality of Linux as an environment for massive simulations. Tools that are essential to modern scientific programming are being added to the Linux environment. Work has begun on support for remote system administration. This is an excellent beginning and CIC should continue to play a leadership role in this arena.

Linear Solvers. This area is a good example of how CIC has been effective in bringing computer science research to bear on problems of direct and immediate interest to the Lab. Ongoing work specifically targets grids of up to a billion cells and thousands of CPUs. The particular algorithms investigated are chosen to address the needs of large codes used to simulate oil reservoirs, plasmas, groundwater, and radiation diffusion. While there are many very fine efforts on linear solvers both in academia and at other national labs, the CIC work is important because it reflects the unique needs of Lab codes and the unique demands of Lab computing platforms.

This approach has been very successful in advancing Lab missions. The linear solver work has been applied effectively in the ASCI Blanca code. It was also applied to a reservoir simulation, in partnership with Amoco and SGI, resulting in an R&D Award for Technical Innovation (the award recognizes the 100 top innovations annually). The project was also a finalist in the Smithsonian Institution's Information Technology Innovation Competition.

Memory Centric Algorithms. One of the biggest challenges in exploiting current HPC machines is that their memory hierarchies, with each level having a different capacity and access time, are susceptible to performance vagaries. The results has been a very noticeable degradation in the efficiency with which even high-tuned scientific applications are able to use today's parallel computers. Traditional theories are inadequate as a basis for investigating algorithms and the limits of computation on such systems. Within CIC, current projects are concentrated on constraint satisfaction problems and memory-efficient data structures. The CIC researchers have ongoing collaborations with a number of other top researchers from academic and industry sites. Their success in solving several open problems may very well lead to a new generation of compiler and library optimizations.

Quantum Computing. This is one of the hottest areas in computer engineering research because it represents a revolutionary new approach to computing. The memory capacity of current quantum machines is only three quantum bits, but it is estimated that if a computer could be built with as few as 30-40 quantum states, the machine would be able to do work equivalent to current supercomputers. (Quantum machines of this complexity are estimated to be only 5 years away.) Further, Shor has shown that quantum computers are capable of very rapid factoring. Since factoring is intimately related to current security methods, there are important practical as well as scientific repercussions. The Lab is an important contributor in this area of research, with projects focused around quantum computing, quantum control, and quantum communication. The research combines fundamental issues in Physics and Computing Science with the potential of changing our view of what might be computed rapidly. The committee notes that this group and their work could well become one of the Lab's "crown jewels".

4. Relevance to National Needs and Agency Missions

Assessment: **Outstanding**

Discussion: Computing is central to the Lab's missions and to those of DOE in general. For example, John Brown listed computing first when discussing the Lab's core competencies in a recent interview. Given that CIC's role is to provide the infrastructure necessary to enable computing Lab-wide, it is hard to discuss this evaluation criterion in isolation from Performance in the Construction and Operation of Major Research Facilities. The committee found that all of CIC's activities clearly reflect this essential role and are consistent with the needs of its "customer base." Further, current Division efforts are establishing a foundation for future growth in computational support that will be responsive to national needs and agency missions. Two examples help to illustrate this.

Scientific Software Engineering. It is of utmost importance to the mission of the Lab that software be correct, maintainable, and modifiable, so that the results can be trusted and consistent progress can be made. The committee was amazed and impressed by the amount of progress CIC has made in this area over the last year. This is completely in line with national concerns. A recent NRC investigation of a reactor software problem has led to a requirement for more formal process on the part of coding teams. The difficulty is how to do that effectively; as we noted in last year's report, other organizations have found it to be an extremely difficult change that is largely cultural in nature.

CIC's approach has been three-pronged: create awareness in the coding community through a series of special programs, provide demonstration test cases of how effective new practices can be, and "infiltrate" the code teams with software engineering expertise. The DRC strongly commends CIC for the appropriateness of its efforts and the rapidity of its progress in this area.

CIC hired one expert in software engineering processes, who has moved with alacrity and energy. Activities were organized to raise the consciousness and interest of software people across the Lab, including seminars by eminent experts, short courses, and informal presentations; many of these were well attended by the target audience, software practitioners. Longer-term relations with consultants are also being established. Software configuration management tools have been introduced to control versions of software and related

artifacts, manage system builds, and formalize regression tests. This was an excellent choice, and has brought a surprisingly strong response. After a vendor tools fair and some experimentation, a number of groups settled on a single tool - which is now a de facto Lab standard and has sprouted a user's group and support staff.

The clearest evidence of success in this arena comes directly from X Division. In a joint meeting with the DRC, Soran made it clear that X is delighted with the help they are getting. They have requested quadrupling the software engineering staff assistance, to a level of 1-4 FTE per coding team. The main concern about increased formal software engineering activity is the need for more space in order to house the additional CIC people they want!

Another significant effort involved introducing the Computing Maturity Model developed at the Software Engineering Institute. Under the best of circumstances, preparing for a CMM audit reveals the biggest problems in a group's software process and can lead to adoption of tools or methodologies that result in better and more predictable results.

Performance Issues for Terascale Computing. One focus area in CIC has been an in-depth analysis of the performance and scaling behavior of ASCI codes. The project group has taken a rigorous approach, examining very low-level chip and connection behaviors as well as other architectural issues, in the context of real simulation codes. (Many performance groups work on kernels or highly simplified models of real computations; the CIC group is analyzing behaviors of real computations.) The group has already made some surprising discoveries relating to where bottlenecks actually occur. While conventional wisdom holds that memory bandwidth is the chief source of performance degradation on highly-tuned codes, these findings indicate that some of the ASCI codes are in fact already limited by computing power, others by on-chip memory queues, and only some by memory bandwidth. Understanding how and why these limits are reached can yield important insights for further optimizations.

Even more important, an understanding of the relationship between code characteristics and performance bottlenecks could provide a much sounder basis for future procurement decisions. The ASCI code characteristics are also being examined in terms of forthcoming changes in commercial chip designs. Because the new generations of high-performance chips are being optimized for media streaming and compression rather than numerical throughput, there are serious implications for the ASCI program as well as other Lab uses of HPC. For example, by modeling the effects on key application performance when the level of interconnection among nodes is varied, the group was able to determine that full connectivity (which is both expensive and, as borne out by experiences with the Blue Mountain machine, difficult to achieve) is not actually necessary. To enable further study of these problems, the group has also established a testbed of so-called "compact applications" - accurate but unclassified versions of key codes that can be distributed for use in performance studies and algorithm improvement efforts among the broader HPC community. The members of the DRC believe that this type of shared testbed could yield significant benefits for the Lab and ASCI in the future, since it provides a more empirical basis for other institutions' research in performance models, tuning tools, and compiler optimizations.

5. Performance in the Construction and Operation of Major Research Facilities

Assessment: **Outstanding**

Discussion: It is impossible to overstate the truly outstanding accomplishments of the Division in developing major new world-class research facilities for computing over the past year. These accomplishments fall into three major areas:

- Installation of the ASCI Blue Mountain machine
- Development of plans for a 30 TeraFLOPS procurement and the new Strategic Computing Complex
- Installation of a collaborative visualization center

These accomplishments reflect the solution of many organizational, management, operational, and political problems. Collectively, they represent a major leap forward for CIC, its user community, and the entire ASCI program.

ASCI Blue Mountain. The new system- which involves 6,144 processors and occupies 12,000 square feet of floor space - was successfully installed over the last year. The effort was plagued by a series of problems, some of which could easily have overwhelmed the effort. The necessary physical facilities upgrades had to be carried out simultaneously with system installation. Changes in policies and directions on the part of the machine vendor meant that CIC had to assume responsibility for a number of significant engineering challenges. Multiple turnovers in personnel at SGI, including at the highest level, provoked some significant sociological and business challenges.

Throughout the process, the CIC team showed extreme dedication and ensured that all obstacles were dealt with effectively. The machine became operational on schedule, despite the fact that many people (insiders and outsiders alike) were convinced the deadlines were impossibly optimistic. The success of this endeavor alone would have earned CIC an "outstanding-plus-plus" ranking. But the accomplishments go beyond simple availability of the machine.

The system has achieved speeds of 1.608 TeraFLOPS, making it arguably the fastest computer in the world. More importantly, the initial results on ASCI codes are very impressive. Within a very short time of bringing the machine online, three different weapons codes were able to utilize over 6,000 of the processors, with a fourth running on over 5,000. Given the architectural, integration, and operational issues involved in a system of this magnitude and complexity, such a level of utilization is significant indeed.

Further, the members of the DRC were pleased to find that CIC had been extremely aggressive in establishing a strong foundation of collaboration with SGI. Initiated by direct negotiations between Slocomb and SGI executives, this involved significant effort on the part of an impressive number of individuals. Some 30 members of CIC staff traveled to Mountain View to coordinate software and hardware needs and to carry out pre-shipment testing at SGI. In the other direction, some 20-30 SGI staff currently work on-site in CIC and the number is growing. Altogether, over 100 members of CIC have been personally involved in these collaborations with SGI.

Strategic Computing Complex. Even while CIC staff were actively working on installing Blue Mountain, planning was moving ahead on the next-generation ASCI platform. After a series of industry visits, a draft RFP was developed late last year and its release is imminent. Plans currently call for awarding the contract at the beginning of 2000, with an early version of the system scheduled for delivery later that year. This is a very aggressive plan, but one that must be carried out if the ambitious goals of the ASCI program are to be met.

In addition to working on the machine procurement issues, CIC has been actively engaged in the design of a new facility to house the ASCI machines. This will be essential, given that the proposed 30 TeraFLOPS machine will require between 15,500 and 22,500 square feet of floor space, up to 6.5 Megawatts of power, and some 1.5-2 tons of chilled air. Nagy has led this effort for CIC. The proposed building includes 267,000 square feet, with room for 5 classified and 1 unclassified collaboratory, plus 4 visualization theaters. In order to meet the machine installation schedule, CIC had to devise an unusual, highly accelerated schedule for bidding, designing, and constructing the facility. By analyzing the dependencies between classical scheduling activities, the team was able to significantly compress the length of time necessary to plan and implement this facility.

Collaborative Visualization Facility. CIC's new visualization laboratory is the largest such facility in the world. More importantly, it is a unique collaborative environment that allows entire teams of researchers to interactively explore and navigate through data. The centerpiece video wall projects very large images for simultaneous viewing by groups of 10-15 researchers. Two immersadesks provide virtual reality capabilities for smaller groups. A video distribution network also makes it possible to provide firstclass visualization service directly to research offices.

The configuration of the visualization server, which is centrally located in the Blue Mountain internal network, allows data to be moved to the server very efficiently and conveniently. The 16 IR pipes on this server represent a dramatic step forward in visualization capability. Because the system was installed only a month ago, there has not yet been time to explore its unique capabilities; we look forward with great anticipation to next year's visit, when we expect to see demos that exercise its full capabilities. The early examples we saw this year indicate that some system of priority scheduling is needed in order to deliver the full performance of the visualization system to users. In particular, image animation performance could be dramatically improved by such

scheduling or by amplifying the data pipeline from disk to screen; plans are for this pipeline to reach 5 gigabytes/sec, but the required disk systems have not yet been installed.

We commend the siting of the visualization lab near its principal users, rather than a CIC building. This choice of location has clearly promoted early use by the designers. The visualization activities here are off to a very promising start, and there is every indication that by our visit next year we will be seeing evidence of how the unique capabilities of this world-class visualization facility can improve the quality of weapons design activities.

The cultural changes implied by the collaborative nature of the facility are particulary promising. The aggressive goals charted by the ASCI program plan require innovative approaches and unique facilities to support that innovation. The collaborative visualization facility is an outstanding initial step along this very challenging road.

6. Programmatic Performance and Planning

Assessment: **Outstanding**

Discussion: The accomplishments of the division and the number of difficult deadlines that were met, in themselves, provide ample evidence that CIC's programs are well organized and implemented. This is only one aspect of organizational health, however.

The members of the DRC commend Slocomb's and his management team for the level of excitement and enthusiasm we found among CIC staff. A vigorous program of team projects, cutting across traditional group boundaries, has been put into place. In addition to significantly improving communications across groups (a problem we noted in a previous report), this approach has provided clear foci for individual and group effort, contributing to a new sense of community and joint ownership.

There is also a sense of shared ownership in the successes of X Division, a situation that has improved remarkably over the last few years. Slocomb clearly led the way for this by establishing regular meetings with his counterpart in X, as we remarked in last year's review. The effects have now permeated all levels of CIC. Many division staff members spend significant amounts of time with the weapons teams. Vigil continues to hold regular weekly meetings for X users and lets them control the sessions (e.g., other CIC staff may attend only at the request of the users). Many CIC research groups are obviously concerned with how to provide better support for users. This situation is a testimony to CIC's growing understanding of X's needs and augurs well for the usability and applicability of future research products. Such a close relationship between the two divisions could not have come about without strong, well-focused leadership within CIC.

Similarly, the exceptional progress in installing and integrating the ASCI Blue Mountain machine would simply not have been possible if CIC had not become a cohesive and motivated division. The management team was innovative in finding ways to foster teamwork and to encourage teams to stay onsite and work around the clock to meet key deadlines.

The Division's management structure has also proven to be cost-effective. In 1998, CIC received the Lab's Distinguished Business Management Award in recognition of outstanding performance in combined management of finance, procurement, and property. At 94.2%, the Division also received the Lab's highest assessment for programmatic information management. As a result of work spearheaded by CIC, the DOE test plan review for Y2K assessed the Lab at 3.75 out of 4.00.

Finally, CIC management was successful in getting computer science and software engineering added as a new category for LDRD support. This recognition of the essential role played by computer science in meeting overall Lab goals has long been overdue.

While many people are responsible for the successes that we have described in this report, it is clear that Slocomb and Vigil both made outstanding contributions. We recommend that special award bonuses be given to these individuals and other key staff members in recognition of the truly herculean efforts they made to ensure CIC's success. (This is common practice in industry and is also becoming increasingly common in the academic research community. The Lab Director should explore possibilities for publicly acknowledging and rewarding the outstanding contributions of these individuals.)

7. Knowledge Management for the Stockpile - A New and Essential Challenge

The new effort in Knowledge Management is extremely important and timely for Los Alamos. All of the direct physics information and design and construction documents from 55 years of stockpile development are in the archives. It is essential that these irreplaceable data are preserved and made available to current and future generations of stockpile stewards. There should be no illusions about how difficult and costly this effort will be. It should be viewed as the knowledge aspect of the entire stockpile stewardship mission, however, not simply as a peripheral activity.

The members of the DRC praise CIC for bringing the problem to a new level of attention. The current phase - setting the requirements and basic directions for knowledge management activities - is crucial. If the job is done well, the result will be a frequently used and invaluable part of the overall security mission. If not done well, the result will be a practically useless hoard of bits. The very best caliber of thinking needs to be applied to this problem, since there are several major obstacles that must be overcome. First and most importantly, serious buy-in is needed from all the data owners. Second, the physical media management and transformation will require new technology as well as significant financial investment. In addition, eliciting crucial information from specialists, managing security, and overseeing sharing will require significant organizational energy. Further, the unusual security concerns will make physical medium conversion more cumbersome, and will complicate access to human knowledge. We believe that the hardest problem will be getting fundamental agreement on sharing and access across current ownership domains; solving this part of the problem will require buy-in at the highest levels of the Lab (and perhaps across DOE).

Project Planning and Management. Because of the difficulty and risk of this enterprise, it is important to maximize use of work done outside the DOE orbit. The planning should take an outsider perspective. That is, CIC should assume that others have already attacked and perhaps solved the individual sub-problems that the Lab must face (e.g., handling old records, security management, knowledge elicitation) and plan to buy their solutions. Only when there is a truly unique requirement or a system integration need should CIC plan to invent technology or write software.

The fastest way to proceed would be to pursue parallel explorations. Talk to organizations with experience in handling some of the sub-problems, while at the same time going after some consulting organizations that specialize in planning and execution of large knowledge management projects. Significant expenditure will be required in the early phases to get consulting and design help, but we believe that it will pay off in accelerating the effort and bringing in fresh thinking. A number of well-established consulting organizations already have a firm base of experience in document and knowledge management practices and can be hired for these purposes.

As a preliminary, the project group needs to make some quantitative estimates including such issues as: How much total information would be captured in digital form? Approximately how is it subdivided into different classes of physical media and what is the basic nature of the information in each? How many of the media are already in the process of deterioration? From how many types of specialists must information be elicited? What kind of timeline is available for major activities?

Prioritization and Triage. A crucial aspect of the challenge is the expected retirement of the experts. It will be necessary to identify who has the expertise relevant to particular sets of data. These people will include not only the recognized superstar designers, but also relatively low level technicians who can interpret engineering diagrams and production information. A key to success of the entire effort will be identifying which documents must be captured and converted early to take advantage of talent that is hemorrhaging. Note that this prioritization may not be the order that would be dictated by normal standards of efficiency.

The decision of the CIC project group to hire recent retirees as consultants is very clever, both strategically and sociologically. Such persons value continued connections to the lab, provide essential information, and also offer a social entree into work groups. This strategy should be formalized and extended.

Physical Media. Key information is embedded in a variety of media, including many outdated and fragile formats such as paper blueprints, microfilm reels and aperture cards, and radiographs. The quantities are daunting, and will require a highly organized "factory" for capture and conversion. Industry faces similar problems

with those older generations of media, so the Lab should try to gain as much as possible from the experience of companies that have already invested in similar efforts, such as Lockheed (with specialized experience in fragile media), Boeing, and Lucent Technologies. Some companies have specialized organizations dedicated to the problems of physical media and document content management.

One problem that is unique to the Lab is that many of the documents are radiologically contaminated. Handling and converting the content of these materials will require innovation. Note that this type of project can take advantage of a number of the Lab's core competencies.

Security. Clearly, the management of highly sensitive information with many different requirements of need-to-know, or even need-to-know-about, makes this project uniquely challenging. The notional goal - to create a federated database containing essentially all knowledge of the US nuclear stockpile - would produce perhaps the single most valuable and security-sensitive corpus on the planet. The links between data currently controlled by different groups would themselves be extremely sensitive, so the linked database would be so highly classified that no individual could access it in its entirely.

The problems that the Lab faces in this area are not unique. We suggest that you confer very closely with the intelligence community (NSA, CIA) to understand how they handle highly interlinked and extremely sensitive materials. It may be possible to acquire a template solution and or some other useful jumpstart.

Human Factors. It will be crucial to raise the abstraction level of the information being preserved. Consider the classic distinction Data -> Information -> Knowledge -> Understanding. In the context of this project, it is not useful simply to provide online access to millions of uncategorized pictures or uncorrelated experimental data. That data must be put into context (i.e., transformed into information) that can be meaningful at the human level. In turn, information must be generalized for application in other contexts (i.e., knowledge) before it can truly assist human understanding and decision making.

While it will be necessary to develop basic taxonomies and ontologies, we caution CIC against spending too much time and effort in the early stages because of the clear need for dynamic extension as efforts proceed.

Because much of the data can only be interpreted and converted to knowledge by human intervention, it is absolutely essential to move quickly to seek the full cooperation of the relevant specialists and to capture their expertise while there is still opportunity to do so. Cultural gaps, the need to develop social incentives, and other human aspects of the problem will present very serious obstacles. We were pleased that the project group has already tackled some of these with careful experimentation and sound judgement.

8. Organizational Challenges

The committee also identified three areas of CIC involvement that present organizational challenges: the recruiting of new personnel; the availability of computing resources for non-ASCII-related research projects; and the dissemination of code and information to the broader community.

Recruiting. We were briefed by Division management concerning CIC's current and projected staffing needs. The members of the Committee believe that given today's competitive marketplace, CIC must be allowed to significantly improve the nature of its recruiting process, particularly in terms of time-to-offer. The available workforce of high-quality computer scientists and computational scientists is a problem at the national level, not just for the Lab. CIC is one of many organizations suffering the consequences. Moreover, the demographics of computer-related education indicate that this situation is going to get worse, not better, over the next decade. Given the urgency of ASCI and other key projects, the members of the Committee note that if CIC continues to have difficulties recruiting skilled staff, important Lab deadlines simply cannot be met.

The most obvious target for improving recruiting is to allow CIC to extend employment offers much more quickly. Top computer scientists are actively being sought by industry and by other research organizations. Many of these groups regularly extend offers at the time the candidates are first interviewed. The delays which currently occur within CIC are unnecessary, and severely hinder the Division's ability to meet programmatic and strategic goals.

The experiences at LANL's sister labs, LLNL and SNL, indicate that streamlined practices can be specifically tailored for high-demand job openings, and that these can significantly improve the rate at which offers are accepted by candidates. It is our belief that CIC could continue to meet institutional guidelines, while reducing the delay period before offers are extended. This is currently 4-6 weeks for most CIC positions. To be competitive in today's market, the period needs to be reduced to 4-6 days. We urge the Lab management to work CIC to make this happen.

Computing for Non-ASCI Research. The Committee was very pleased to hear of Slocomb's efforts to set aside computing resources to support Lab research projects that are not directly related to ASCI. As we noted last year, it is important to recognize that CIC's user base encompasses all groups within the Lab. While the influx of funding for ASCI has made it possible for the Division to grow in size and importance, it is not in the long-term interests of the Lab to focus too closely on ASCI developments.

The new "Cycles for Science" program is an important step in this direction. For the first time, Lab funds are being committed specifically to provide HPC cycles to other research areas. The Committee urges the Lab to increase this funding even further. By way of comparison, LLNL's annual budget allocates almost ten times as much for this type of activity. The types of projects supported by "Cycles for Science" could lead to future programs that rival ASCI in intensity and national urgency - their potential impact should not be overlooked.

Dissemination of Code and Information. As noted in earlier sections, many of the recent accomplishments of CIC project teams are of national significance. It is important that the Division share these accomplishments with the rest of the HPC community. Not only does this increase the stature and recognition of the Lab and provide a service to other HPC organizations, but it provides a foundation for future developments and collaborative efforts. The members of the Committee urge CIC to be more proactive in disseminating information about its experiences.

It is also in the Lab's best interest to disseminate the software developed in CIC. This could ultimately lead to significant returns on CIC's own investments by attracting further enhancements done by other research groups, by initiating new collaborations, etc. Such dissemination includes the sharing of software testbeds, such as the Compact Applications to further research on performance and algorithmic improvements.

We note this as an organizational challenge because it is not easy to establish mechanisms for "sanitizing" publications and software. Procedures need to be put into place for expeditiously determining what items can and should be disseminated, and for tracking demand for them (in order to assess the effectiveness of dissemination mechanisms). A number of other organizations already have experience in this arena, including the NSF HPC centers, large research universities, and some of the NASA sites. We urge CIC to discuss the successes and problems that these groups have experienced, and put into place mechanisms that will allow the larger community to benefit from the Division's successes.

9. Conclusions and Recommendations

The members of the DRC commend Slocomb, his management team, and the CIC staff for their extraordinary accomplishments during the past year. We are particularly pleased to note that the approaches that were used, not only were effective in pursuing the specific goals of this year but build a strong foundation that promises continued impact in years to come. Our recommendations, therefore, should not be perceived as indications of current weaknesses, Rather, we would like to encourage specific objectives that can help CIC continue its successes.

Recommendations to Lab management:

- The integration between computer science research teams and ongoing practical computation projects has paid off handsomely and is one of the unique aspects of CIC that has made it so successful. This is a tremendous strength that should be strongly encouraged by the Lab management.

- CIC has taken some remarkably strong steps toward improving the quality of software engineering among Lab scientists. Based on experience in other organizations, it will take many years to change the Lab culture. We must stress the importance of increasing the resources allocated for improving the level of scientific software engineering practice.

- Software configuration management is a relatively "easy sell" because it produces immediate benefits to the programmer and the group. The next steps in converting your user base to software engineering will introduce more detailed test plans, establish requirements and specifications documents, and put all of that information under strict configuration control. These improvements are essential to stabilizing the software process, but do not yield immediate gratification. Given the traditional "cowboy" or heroic solo practitioner model at the Lab, it will be a daunting task to get these steps accepted and for a more disciplined approach to become standard throughout the Lab. Lab management should periodically reiterate its commitment to sound software engineering practices.

- CIC should not just continue, but expand its leadership role in knowledge management for the stockpile. Logically, the Division would also have much of the responsibility for execution. However, it will need visibility and support across the Lab in order to achieve the level of success that the mission demands.

- In approaching the knowledge management tasks, CIC should take special care to benefit as much as it possibly can from the experiences that other agencies and companies have had. This will require significant efforts to contact a variety of organizations and consultants, but will give the Lab a jump start on problematical issues such as media preservation, document content management, and security management.

- CIC is falling behind because of cumbersome recruiting practices enforced at the Lab level. Given the urgency of new hires and the incredible demand for people with the skills that CIC seeks, it's essential to establish streamlined procedures for new hires. Further, CIC must be allowed to compete with market offers.

- While X Division is CIC's biggest customer, it is not the only one. The unique computing resources need to be leveraged for other types of new scientific work, too. The Lab should expand its program of Cycles for Science to get it up to levels consistent with those of peer institutions.

- The Laboratory should make every effort to inform the community and the nation of the kinds of accomplishments cited in this report. We recommend a multi-pronged approach that could include:

    - conference papers

    - special issues in respected journals

    - a feature article in Scientific American

    - a segment on NOVA or Discovery

Recommendations to Division management:

- CIC should make more effort to share its experiences with the broader national community. The Division is on the leading edge of exciting computer science research and practice. CIC should encourage more dissemination by improving the reward structure for external papers, presentations, etc.

- It's in the Lab's best interest for CIC to disseminate its software as well - this initiates new collaborations and could lead to significant returns on CIC's own investments by attracting further enhancements done by other research groups. This includes sharing software testbeds such as the Compact Applications to further research on performance and algorithmic improvements.

- Getting first-class people with appropriate training and experience to expand the scientific software engineering effort should be a continuing priority for the Division.

- The lecture series and short courses to introduce code teams to the benefits of sound software engineering practices have been extremely effective. CIC should continue these so that they become a regular feature of Lab culture.

- CIC should continue leading national efforts in extreme Linux, in order to make it a first-class base for scientific computing and to extend work in collaboration with the broader national community.

Self Assessment For: Information Management
Office of Primary Responsibility:
Approved By: _____ _____ Charles Slocomb, Division Director Date _____ _____ Bob Newell, Functional Manager Date